Agrisystem and K&I

The community

Employment

Regional communities

Environment

Markets

Market focused

Differentiating markets

International competition

Consumers

Healthy living

Empowered choice

Maintaining trust

Value add

Farms gate $60bn
Agrisystem $800bn

Exports

$44.8bn
1.6m of all Australian exports

Employment

Farm workforce 300k
Farm dependent 1.6m

The agrisystem joins production with the community and consumers through the value chain.

The knowledge and innovation ecosystem creates value by providing the agrisystem with innovation to sustainably meet the demands of consumers and the community.
Foreword – Michele Allan

More than $3 billion a year is invested through Australia’s rural research and development sector, driving long-term growth of our production industries and underpinning a huge slice of our economy. Our agri-sector is the source of most of what Australians eat, the fibres used in clothes we wear and we use agri-products to build and fill our homes.

It is how we manage more than half of the continent without government subsidies, underpins the economies of our regional communities and continues to be a source of national identity. So it is only right that we should think about the future that we want for our community, environment and industries, and about how research, development and innovation can help achieve that future.

In 2017 the Council of RDCs embarked on the development of a vision for the future of Australia’s rural innovation system. We are proud to present this report and our conclusions.

Through our work we’ve identified that Australia has potential to be a pivotal global player in food and fibre value chains, if we choose to be. We can secure community and environmental wellbeing, be an attractive destination for investment and grow sustainable wealth for regional and national communities.

A world-class, high performing and effective knowledge and innovation ecosystem is an essential part of this vision of the future.

Determining where we want to go is just the first step. Agreeing on how we get there and negotiating the processes of change and transition can be complex, intricate and involved.

With a vision and a plan, the future can be ours to make and take. We hope you’ll find our vision inspiring and join us on the journey.

Dr Michele Allan
Chair, Council of Rural RDCs
November 2018

The agrisystem describes how we use natural resources and biological processes to generate value through food, fibre and related products and services. A system level perspective reveals new opportunities, additional ways to create value and a new vision …

Our vision is of flourishing agriculture, fisheries and forestry industries underpinning a thriving agrisystem. Driving future success is a globally-connected, highly effective and dynamic knowledge and innovation ecosystem.
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<td>Develop and implement a national, integrated, whole-of-government strategy for an enhanced agrisystem,</td>
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<td>Focus, beneficiaries</td>
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<td>Scale</td>
<td>$60 billion</td>
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Megatrends – major changes that will impact on rural industries

A hungrier world

The world is getting hungrier – it needs much more food. With appropriate innovation in farm production systems, supply chains and governance, agriculture is well positioned to keep pace with growing demand. The “Hungrier World” megatrend tells the story of a rising world population and increasing food consumption accompanied by a shrinking global agricultural land area, water scarcity and spiralling energy demand. According to the United Nations Food and Agriculture Organisation (FAO) the world must increase agricultural output by 70 per cent to feed its growing population by the year 2050. However, the world is estimated to be losing 12 million hectares of agricultural land each year to desertification and urbanisation. In addition to this are the challenges of climate change and water scarcity.

A wealthier world

In the megatrend “A wealthier world” the study outlines the impact on global commodity markets and Australia’s rural industry from income growth both domestically and internationally. In the developing Asia region alone some 1.02 billion people will cross an income threshold and move out of poverty and into the middle classes. Average incomes are forecast to rise from US$12,000 per person to US$44,000 per person by the year 2060. Rising wealth is having impacts on commodity markets. People are increasing their average daily calorie intake which means more food will be demanded. They are moving out of subsistence production so are more reliant on markets for food.

Choosy customers

The consumer of the future will have great expectations for the food and fibre products they purchase. Today’s consumer has different tastes, preferences and concerns to the consumer of twenty years ago. For example, organic certification, free range eggs, health labels and fair-trade logos were much harder to find in the supermarket of 1985 yet in supermarkets of the year 2015 these labels are commonplace. Such trends are likely to continue. Health is likely to become a particularly prominent driver of food choice and consumption patterns which has impacts both within and beyond the farm gate. Information technology will increasingly enable the consumer to selectively access, share and validate information about products along the whole farm to fork supply chain.

Transformative technologies

Advances in technology within the fields of digital, genetics and materials science will change the way food and fibre products are created. Genetic technology will allow crop and pasture yields to improve and become more resistant to weeds, pests and climate risks. Advanced sensory systems and data analytics will permit advanced and highly integrated farm to fork supply chains. Customers will be able to readily trace food and fibre products from their origins and supermarkets will have increased tools for quality assurance. Satellite and other remote monitoring technologies will allow governments and “the crowd” to access information about farm condition and management practices at low cost. Lastly, the world of synthetics is likely to advance rapidly as breakthroughs occur in the field of advanced materials science and food manufacturing.

A bumpier ride

Risk is an ever-present characteristic of Australian agriculture, but the risk profile is set to change. The coming decades will see changes in the global climate, environmental systems and world economy which create new and potentially deeper risks for farmers. This is largely due to the interconnectedness of worldwide environmental and socio-economic systems.

Climate change is elevating the frequency and severity of extreme weather (e.g. droughts, floods, bushfires). The globalisation of supply chains, which provide inputs (e.g. fertilisers, fuel, chemicals) critical for agriculture, increases the number of links in the production system, and therefore, the risk of supply chain breakdowns. A challenge is posed by increased weed and pest resistance to herbicides and pesticides which is reducing their effectiveness.

Megatrends – continued

$24 billion

Potential size of Australia’s carbon farming market by 2030

$3.3 billion

R&D expenditures across rural industry in 2014-15

1.6 million

The number of people directly employed in Australia’s farm dependent economy

$58.1 billion

Value of farm-gate output in 2015-16 and forecast to more than $60 billion in 2017-18

63%*

Proportion of productivity gains in broadacre cereals in Australia attributable to research, development and extension over more than 50 years

2.7%

Annual productivity gain across agriculture, fisheries and forestry since 1989
$1.74 trillion
Size of the Australian economy in 2017

36.6 million
The number of people outside of Australia fed by our industries on a daily basis

$2.05 billion
Annual government direct or facilitated investment in rural RD&E in 2014-15

$345 million
Funding contributed by Universities to rural R&D in 2014-15

$6,412.8 billion
Total value of Australia’s natural capital assets, 90% of which is land

47%
The portion of the Australian economy whose value is dependent on biology

51%
Amount of Australia occupied by agricultural business in 2016-17

For sources see Appendix 3
Introduction

The future of Australia’s rural industries is bright and evolving rapidly. Innovation has been core to the success of Australia’s rural industries over many decades. Research and development has enabled producers to manage Australian conditions to create wealth that supports our regional and rural economies and communities; contribute to our national economy; and sustainably manage over 50% of Australia’s land.

However, we know there are significant challenges and opportunities ahead. Now, more than ever before, Australia needs to unleash its innovative capacity to fuel the ability of our agricultural sector to adapt to new and emerging challenges and to capitalise on future opportunities. It is time for new ways of thinking about the role and opportunity of our agricultural, fisheries and forestry industries, and what that will mean for research, development and innovation.

Through the Council of Rural Research and Development Corporations, the RDCs have been developing a vision for the future of Australia’s rural innovation system. Our aim is to encourage the right settings for our rural R&D and innovation sector, ensuring it is fit for purpose to empower industry and meet broad production, economic, social and environmental goals.

Our vision is of flourishing agriculture, fisheries and forestry industries underpinning a thriving agrisystem. Driving future success is a globally-connected, highly effective and dynamic knowledge and innovation ecosystem. Individuals, businesses, industries and governments are empowered to apply information, knowledge, skills, expertise and wherewithal to respond with flexibility and agility in the face of emerging challenges, new technologies and hanging societal and market expectations.

Our nation builds on the strengths of our production industries and research capacity to find and realise opportunities to create, add and capture value up and down agrisystem value chains. Australia’s agrisystem is successful and prosperous, growing sustainable wealth, supporting national, rural and regional economies and improving community and environmental wellbeing.

A globally-connected, high-performing knowledge and innovation ecosystem underpinning a thriving Australian agrisystem

Innovation is the key driver of future productivity growth and prosperity. It is a process through which we apply knowledge, skills and experiences to adapt and transform. Australia’s has a high-quality research sector which delivers world-class outputs, but this work is could be better integrated with the current and future needs of industry. Taking a systems approach, aligning around ambitious goals and implementing appropriate governance arrangements will support more efficient, effective and impactful responses.

Australia’s agrisystem improves community and environmental wellbeing, positions Australia as an investment destination of choice, and grows sustainable wealth through the national and regional economies

The agri food and fibre system, or agrisystem, describes how we use natural resources and biological processes to generate value through food, fibre and related products and services. A system level perspective reveals new opportunities, additional ways to create value and a new vision for our production industries underpinning future prosperity, with benefits for the economy, community and environment.

The agrisystem covers an estimated $800 billion of the Australian economy, is the source of basic requirements for society, and supports management of more than 60 percent of Australia’s land mass without government subsidy. It provides millions of jobs across rural, regional and urban communities, and is a major source of national income through exports. Enhancing and facilitating a thriving agrisystem is a national imperative.

The agrisystem is supported by a knowledge and innovation ecosystem, built upon our world-class research and development capacity. The knowledge and innovation ecosystem enhances and improves the agrisystem, providing knowledge and capacity to develop, deliver and adopt new products, technologies, practices and services. It is how we generate impact from R&D for industry and the community. Research and development provides a foundation for the knowledge and innovation ecosystem. R&D must be integrated within production and value chains to deliver impact through food and fibre products, and related products and services, to meet the needs and expectations of the community and consumers.
Community and consumers are king
The future of Australia’s production industries will be driven by the needs and preferences of consumers and the community. Consumer responses within markets determine what products and services are successful. The community’s social and regulatory power determines what production is allowable. Meeting the needs of consumers and communities will require greater connectivity and flow of information up and down food and fibre value chains.

Between them, consumers and the community will determine the future conditions industry will operate under – the social licence to operate. However, producers and production provide a foundation for the value chains which are, in turn, essential to the generation and distribution of food and fibre products. Without producers, there is no agrisystem.

More than food and fibre
Food and fibre production are the heart of our industries, and through these value chains industry addresses basic needs of society. Opportunities will arise to build on our strengths and grow new sources of value. Industries need new ways to produce and compete in the face of challenges from international competitors and synthetic foods and fibres. Products will embody new technologies for health and wellbeing, such as omega 3 long-chain acids in cereals. Wastes will be converted for alternative energy sources. Production skills and resources can be applied to meet new markets in environmental services. And our know-how and ingenuity can be packaged into tools and services to be exported and sold around the world.

Beyond the farm gate
Agricultural output was $63 billion in 2016-17, and the NFF has set a target of growing this to $100 billion by 2030. This goal is important and represents a significant challenge. However, farm gate value significantly under-estimates the overall contribution of the agrisystem. Our opportunity is to innovate and build on the strength of the production sector to create value up and down value chains, delivering benefits for producers, communities and the broader Australian economy.

Critical to this opportunity will be the ability to create connectivity and information flows along and across value chains. With a small domestic consumer base Australia’s agrisystem is heavily exposed to exports, requiring capacity to respond to cultural, geographic, jurisdictional and language differences.

Geography is not a defining feature
Australian industry and production sits within a global context where ideas, talent, technologies, products and services flow in new ways, far beyond the traditional farm-gate boundary. New production sites, including intensive aquaculture and vertical farming, are being located within urban areas. Most downstream manufacturing and post-farm gate value adding occurs somewhere that is not rural, and most consumers and communities are urban. Australia’s food and fibre value chains extend into the very heart of cities here and overseas. Creating connections across value chains brings with it opportunities to grow the talent, resources and technologies available to our industries.

Understanding the necessity of meeting the expectations of consumers and the community lie at the heart of four key challenges and opportunities facing rural industries as we progress to 2050.
New thinking for the future

Innovation is recognised and understood to be the key driver of future productivity growth and prosperity. It is a process through which we apply knowledge, skills and experiences to adapt and transform. Australia has a high-quality research sector which delivers world-class outputs; however, the opportunity exists to improve the interface between researchers and industry to ensure research focuses on the current and future needs of industry. Taking a systems approach, aligning around ambitious goals and implementing appropriate governance arrangements will support more efficient, effective and impactful responses.

There is an opportunity to grow the future benefit for and from Australia’s rural industries by broadening the focus of the rural innovation system beyond the traditional concentration on farm productivity. This broader view takes into account:

- The sustainable management of natural resources;
- Food and fibre production;
- Downstream value chains that accumulate, process, manufacture and market raw and processed food and fibre products; and
- Broader needs and expectations of the community and the environment.

The Council of Rural RDCs has described this broad value chain, reaching from the underpinning communities and environment, through production to the creation and delivery of consumer facing goods and services, as the Australian agrisystem.

The successful expansion of rural innovation across the Australian agrisystem requires the development of a dynamic knowledge and innovation ecosystem that fosters trust between system participants including researchers, producers, investors, community stakeholders and consumers. With increasing levels of trust, awareness, connectivity and alignment of goals will come new opportunities for collaboration.
Understanding Australia’s Agrisystem

Australia’s food and fibre production sector sits within and provides a base for much larger and longer value chains. The agrisystem is also broader than just food and fibre value chains as it encompasses ecological, sociological, economic and production elements. It is about the utilisation and harnessing of natural resources and biological processes for the creation of value in the form of food, fibre, fuel and other related products and services. Through the agrisystem the success of value chains is linked to the needs of the environmental and the community, alongside the needs of producers and other value chain participants. The agrisystem highlights the opportunity to drive value back to the farm gate, and to rural and regional communities, by developing and delivering sought-after products to consumers.

The agrisystem also encompasses the generation of enhanced food and fibre products as well as non-food and fibre products. Crops that are modified to produce nutraceuticals such as omega 3 long chain acid in plant oils. By-products and wastes of current food and fibre production systems converted into higher value items such as biofuels. New markets emerging for other resource utilisation practices such as environmental services or carbon farming. Carbon farming itself could be a $24 billion market by 2030, a major opportunity to build on the strengths and resources of the production sector.

The agrisystem is a different approach because it explicitly includes consumers and communities as stakeholders alongside producers and production, and it connects them through food, fibre and other value chains. Understanding the breadth and depth of the agrisystem allows us to think more broadly about its value of production industries and the chains they support for the economy and the wellbeing of all Australians. It also allows us to think differently about the knowledge and innovation needed to enhance and increase these benefits.

Our definition of the agrisystem is based around a set of unique features and characteristics. Industries which do not utilise and build value on both natural resources and biological processes are out-of-scope, as are industries which produce synthetic food and fibre products.

The Australian agrisystem is a significant exporter and contributor to global supply of food and fibre despite our relatively infertile soils, low rainfall, low yields, seasonal and market volatility and a high cost of production. We have innovative capacity and are often rapid adopters of technology. Our skills and expertise will be in demand in a world that is trying to feed more people using less resources, deal with variability and risk, and meet the needs of a more demanding consumer class. Nurturing, promoting and exporting these skills and technologies along our value chains is another source of opportunity for the agrisystem.
The agrisystem joins production with the community and consumers through the value chain.

The knowledge and innovation ecosystem creates value by providing the agrisystem with innovation to sustainably meet the demands of consumers and the community.
Australia's agrisystem improves community and environmental wellbeing, positions Australia as an investment destination of choice, and grows sustainable wealth through the national and regional economies

The agrisystem is a description of how we generate and build value from our soil, water and energy resources and biological processes to create and grow sustainable wealth while enhancing community and environmental wellbeing for Australians. The agrisystem covers an estimated $800 billion of the Australian economy, is the source of basic requirements for society, and supports management of more than 50 percent of Australia's land mass without government subsidy. It provides millions of jobs across rural, regional and urban communities, and is a major source of national income through exports. Enhancing and facilitating a thriving agrisystem is a national imperative.

A thriving agrisystem, and the production industries at its core, will rely on a globally-connected, high-performing knowledge and innovation ecosystem. The knowledge and innovation ecosystem provides the skills and capacities for us to discover and apply knowledge, and the know-how required to innovate and create, to develop new products and services and adapt to changing market, environment, social and production conditions.

Research and development provides a foundation for the knowledge and innovation ecosystem. R&D must be integrated within production and value chains to deliver impact through food, fibre and related products and services, to meet the needs and expectations of the community and consumers.

Australia does not take a systematic approach to rural research, development and innovation – the sector was not conceived and has not been developed as a system. Rather it is a collection of interconnected and at times overlapping components, each managed independently and in line with a variety of strategic and organisational imperatives.

The nature of our federated nation, diverse geographies and disparate industries means this complexity is not going to change. However, establishing the right conditions will help us create the future. We need to have purpose and understand what we strive for, our intent. We can then work out where to focus our strategy and identify the skills we need to be successful. Governance arrangements are needed that provide for a strong alignment between organisational mandate and the interests of stakeholders. The right settings will support an effective system culture to emerge.
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<th>K&amp;I ecosystem</th>
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<tr>
<td><strong>Why does it exist?</strong></td>
<td>To position Australia’s agrisystem for growth, sustainability, prosperity and international competitiveness.</td>
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<tr>
<td>To sustainably create and distribute value from food and fibre, and related products and services, while managing inherent production and operating risks.</td>
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<td><strong>What does it do?</strong></td>
<td>Discover and apply knowledge to create value in response to the requirements of the agrisystem, and the needs of society, markets and consumers.</td>
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<td>Sustainably convert natural resources into food and fibre, and related products and services, while meeting consumer and community expectations and demands.</td>
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<tr>
<td><strong>Why is it unique?</strong></td>
<td>The K&amp;I ecosystem drives prosperity by providing agrisystem knowledge and capacity to address the unique characteristics of Australia’s natural and operating environments. It generates domestically relevant knowledge and innovation, and leverages international R&amp;D.</td>
</tr>
<tr>
<td>Only the Australian agrisystem applies our know-how and tenacity, shaped by our unique natural and operating environment, to create sustainable wealth and community wellbeing for Australians through food, fibre and related production and service value chains.</td>
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<tr>
<td><strong>What’s our ambition?</strong></td>
<td>Australia is a pivotal global player in food and fibre value chains.</td>
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<tr>
<td>A globally connected, high-performing K&amp;I ecosystem underpinning a thriving Australian agrisystem.</td>
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<tr>
<td><strong>What would this result in?</strong></td>
<td>1. <strong>Community and environmental wellbeing</strong></td>
</tr>
<tr>
<td>Australia’s national, regional and rural communities are flourishing because of a strong and sustainable agrisystem.</td>
<td>Australia has an agrisystem that responds with flexibility and agility in the face of emerging challenges, new technologies and changing societal and market expectations.</td>
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<td>2. <strong>Destination of choice for agrisystem investment</strong></td>
<td>2. <strong>A world-class R&amp;D industry supporting a thriving agrisystem</strong></td>
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<td>Australia’s agrisystem is an investment destination of choice, enabling production capacity optimisation and enhanced value creation</td>
<td>Australia has an R&amp;D industry supporting talent and research, development and innovation capacity and foresight to support advancement of the national and global agrisystems.</td>
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<td>3. <strong>Growing sustainable wealth</strong></td>
<td>3. <strong>Information and knowledge for value creation</strong></td>
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<tr>
<td>Australia’s thriving and profitable agrisystem is an essential component to sustaining the national and regional economies.</td>
<td>Australia’s agrisystem has the information, knowledge and know-how needed to optimise its production processes, now and into the future.</td>
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<tr>
<td><strong>What do we need to achieve this?</strong></td>
<td>• <strong>Research efforts aligned with the needs of industry, the community and the environment</strong></td>
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<tr>
<td>• <strong>Confidence, capacity and capability for success</strong></td>
<td>Frameworks that increase the engagement of domestic and global research capacity with industry and community stakeholders.</td>
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<td>• <strong>Enhanced profitability of production</strong></td>
<td>Leadership capacity, the ability to make evidence-based decisions and availability of skilled people to support sustainability and prosperity.</td>
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<tr>
<td>• <strong>Enhanced social and environmental sustainability</strong></td>
<td>Productivity and efficiency is enhanced to support adaptiveness, resilience and international competitiveness.</td>
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<tr>
<td>Industry maintains the trust and confidence of the community in the long-term Industry are effective custodians of natural resources</td>
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From Agriculture to Agrisystem

Shifting our perspective to embrace a more holistic view, the agrisystem, rather than the traditional view based around agriculture, fisheries and forestry production, allows us to think differently about our opportunities and potential. The agrisystem already exists. Taking a system perspective reveals ways to grow and affords new opportunities to create value by building on our strengths, skills, capacities and resources. It allows us to identify synergies and partnerships, connect individual components to increase scale, and align interests along value chains towards common goals.

Australia’s unique circumstances drive the performance of today’s rural industries. Our capacity to create and apply new technologies has enabled Australia to remain globally competitive despite resource constraints, seasonal variability and market volatility. With exportable food and fibre surpluses Australia is an important contributor to meeting global demand. The sector generates more than $44 billion of export revenue.

Agricultural output was $63 billion in 2016-17, and the NFF has set a target of growing this to $100 billion by 2030. This goal is important and represents a significant challenge. The food sector is about 12 percent of the Australian economy. The food and grocery segment is worth about $130 billion a year and the food sector employs about 1.6 million people. None of these measures adequately reflect the full value of the contribution of the sector to Australia and only hint at the opportunities available through a more considered approach to maximising potential across broader value chains. A focus on the value chain does not detract from the need to create value for Australia’s farmers, fishers and foresters, but it recognises the opportunity to increase the value of their produce and the resources available to them.

These value chains are critical to our economy. A recent performance review of the rural innovation sector used OECD data to estimate the impact of biology within the Australian economy. The review concluded that almost 50 percent of total economic activity in Australia builds value upon biological inputs and biological processes. The agrisystem productively harnesses and utilises natural resources and biological processes to generate value and is worth as much as $800 billion a year to Australia.

The agrisystem also delivers value in other ways. It provides a foundation for our society by supplying many of the basic needs of our population. It delivers management, care and stewardship of more than 50 percent of the Australian land mass and vast areas of marine resources, without government subsidies or payments common in other parts of the world. It provides jobs for millions of Australians across rural, regional and urban communities, and is a source of national identity and pride.

The agrisystem approach provides us with an holistic view of how we can ensure long term wellbeing of our communities and the environment through managing our physical and human resources as part of the integrated system of value creation. It supports Australia being an attractive investment destination by creating greater alignment and stability across the value chain and facilitating the development of broad industry strategy. Securing new investment is a priority to ensure our productive capabilities can be renewed and optimised, and opportunities to add and capture value are realised.
Future of the Agrisystem

The agrisystem is the foundation of Australia’s economy and community. It has strong growth potential based on the quality of Australian product, proximity to international growth markets and international counter seasonality.

Domestic and global consumers have increasingly discerning and dispersed preferences and are becoming more demanding. Consumers are seeking more information and more successful value chains will meet this need. Producers will also need more information to respond effectively and in a timely fashion to changing consumer preferences. The value chain connection and flow of information is critical; empowering consumers to have more information and assurance about how food, fibre and other products and services provided by the agrisystem meet their needs and supporting producers to achieve greater value. Our ambition is for Australia to become a pivotal global player in food and fibre value chains, and in doing this, to deliver significant positive outcomes:

Community and environmental wellbeing

Australia’s national, regional and rural communities flourish because of a strong and sustainable agrisystem.

The agrisystem provides a necessary economic and social base that supports rural and regional communities. During times of downturn in agricultural economic activity, the flow-on effects for many communities become obvious. Successful industries provide jobs and economic activity. Community leadership from participants in the agrisystem fuels social environments that are attractive to individuals and families. Individuals and families sustain the on-going needs of the community. Sustainable practices reduce negative impacts and increase environmental amenity, further increasing the attractiveness of these locations as places to live and work. A thriving agrisystem supports lifestyles and livelihoods.

Destination of choice for agrisystem investment

Australia’s agrisystem is an investment destination of choice, enabling production capacity optimisation and enhanced value creation

Australia’s agrisystem needs to be an investment destination of choice to optimise production capacity, enhance value creation and attract the injection of capital required to realise its potential. Investment in innovation and infrastructure is necessary across the value chain.

Investment that grows and stabilises variability in farm production creates the incentive for investment in supply chain infrastructure due to regularity of throughput. Likewise, investment in efficient infrastructure that optimises returns back to the farm gate creates the incentive for further investment in productivity enhancing technologies and practice on farm.

Growing sustainable wealth

Australia’s thriving and profitable agrisystem is an essential component to sustaining national and regional economies.

Food and fibre production through agriculture, fisheries and forestry is a comparative advantage for Australia. More than two-thirds of Australian agrisystem production is exported, creating a substantial injection of funds into the Australian economy. There is potential also grow value through an agrisystem service sector with core skills and experience in achieving consistent and quality production outcomes in spite of resource limitations and volatile operating and market conditions. Based on the current drivers of population, increasing affluence in Asia, and the demands for food, fibre, fuels and related products and services, Australia’s agrisystem is well positioned to participate globally to boost national and regional economies.

Integration of profit-driven production outcomes with the stewardship of our natural resources provides a base for long-term success and sustainability of the agrisystem, the communities it supports and the environments it relies on. Long-term productivity and financial gains can be delivered through improved environmental practice and resource use, as demonstrated by the adoption of minimum tillage and improved irrigation practices.
The knowledge and Innovation requirements of the agrisystem

The speed at which the agrisystem transforms will increase in coming decades. There will be disruptions from new technologies (e.g. automation, data analytics), production methodologies and location (intensification and vertical farming), environmental challenges (seasonal variability and climate change) and community expectations (higher levels of animal welfare and environmental assurances). However, regardless of the changes, the focus of the agrisystem will remain on the community and consumers. Regulation and markets will dictate trends with markets dictating trends in the type, production and distribution of food and fibre. Research, development and innovation will position the agrisystem for success.

For the agrisystem to be sustainable and flourish, challenges must be addressed and opportunities realised. We will require new information, knowledge, technology, skills, expertise and capacity. Participants in the Australian agrisystem will need to continue to innovate and adopt new innovation on an accelerating timeframe.

The production and consumption of food and fibre has become globally interconnected. Value is being created and added in many different ways. Chains will be challenged to provide more from less, driven by the demands of an increasing global population seeking volume, quality, and more personalised product.

A globally connected and high performing knowledge and innovation ecosystem supporting a thriving Australian agrisystem

The application of Australia’s world-leading knowledge and innovation capacity will enable participants in Australia’s agrisystem to change and respond, to be positioned for growth, sustainability, prosperity and international competitiveness. A successful and effective knowledge and innovation ecosystem will mean:

The capacity for the agrisystem to adapt and be resilient

Participants in the agrisystem have the capacity and capability to respond with flexibility and agility in the face of emerging challenges, new technologies and changing societal and market expectations.

Insight into current and future operating environments is needed to design and deliver leading edge R&D outputs that are readily adopted. That insight is fostered through connections within the agrisystem between those engaged in the discovery and application of knowledge and the people and businesses who adopt, integrate and innovate using those knowledge resources to deliver solutions to challenges and opportunities. This continual and iterative process provides participants with foresight, direction and capability necessary for change.

A world-leading R&D industry supporting a thriving agrisystem

Australia has an R&D industry supporting talent and research, development and innovation capacity and foresight to advance the effectiveness of national and global agrisystems.

Research and development forms the basis of the knowledge and innovation ecosystem, and R&D must be integrated within production and value chains to deliver impact.

Research and development is a strategic economic activity in its own right, generating value for Australia. Fostering a world-leading R&D industry will take advantage of Australia’s excellent R&D capacity and capabilities, and leverage them to increase returns for Australia through enhanced production, access to global knowledge resources and export of knowledge services. The R&D industry will require talented people who understand the unique characteristics of Australia’s natural and biological resources, while also having a global perspective. Some of this talent will be found in Australia. The frameworks that support the R&D sector will also need to identify and attract other talent from across global networks.

Participants in the knowledge and innovation ecosystem will primarily focus on challenges facing Australia’s agrisystem. However, in many cases our challenges will be shared with other countries. Global connectivity will ensure that Australia is able to tap into and take advantage of new knowledge, approaches and technologies, as well as having the opportunity to export our knowledge and innovation services.
Information and knowledge for value creation

Australia’s agrisystem has the information, knowledge and know-how needed to perform, now and into the future.

Outputs from the knowledge and innovation ecosystem include information, knowledge, new technologies, innovative products and know-how, enabling Australia’s agrisystem to undertake production while responding to current and future challenges. Knowledge and innovation will need to be:

• consumer and customer focused so that the agrisystem will deliver to the demands of the market;
• developed to meet the varying demands across the value chain. The chain adds value to the commodities produced and cannot be partitioned from the agrisystem. Value-adding processes will enable Australian agribusinesses to capture lucrative, emerging niche markets.

The development, sharing and application of information, knowledge and know-how provides currency, and supports the agrisystem to adapt and adjust products, production and processes to respond to changing community expectations and consumer demands.
Addressing the Industry-Research and Development Gap

According to Innovation and Science Australia, innovation is the key long-term driver of productivity growth within an economy. More generally, innovation is the key enabler of adaptability and renewal across all sectors of society, and thus is an important determinant of how readily communities (and industries) can adjust to external influences. Innovation is about doing something differently and creating value as a result. Research and development is a foundational source of innovative capacity and drive.

A challenge within an innovation system is how to close the gap between R&D providers (whether publicly funded or private) and industry participants who can take and apply R&D outputs and convert them into productivity gains and other sources of value. Governments play important roles in establishing policy settings and directing their own investments in R&D to areas of priority. The abilities to connect various participants, align strategic priorities and leverage different capacities are important for the system.

<table>
<thead>
<tr>
<th>Table: RD&amp;E funding in 2014-15</th>
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<tbody>
<tr>
<td>Australian Government</td>
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<tr>
<td>State and Territory governments</td>
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<tr>
<td>Contribution from universities</td>
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<tr>
<td>Levies</td>
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<tr>
<td>Private funding of own R&amp;D</td>
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<tr>
<td>TOTAL</td>
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<td>TOTAL directly invested or facilitated by governments</td>
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Source: ABARES 2017

Australia’s current research and development sector consists of Federal and State Government funded organisations (eg CSIRO and state departments of agriculture), Rural Research Development Corporations, university organisations and private sector companies. The balance in the amount research between participants is changing, and there is an increasing number of private investors and entrepreneurs entering the sector. Each of these stakeholders has their own needs, outcomes, ways of operation and direction. The knowledge and innovation ecosystem integrates the needs and expectations of consumers and community as well as producers and production (as beneficiaries), investors, supporters and stakeholders.

A mission-based approach to investment across the knowledge and innovation ecosystem will support participants to develop a strong degree of trust, collaboration, alignment of purpose, and leadership to establish the shared goals that will drive progress.

An estimated $3.3 billion is spent on rural research, development and extension in Australia each year, with funds draw roughly equally from public and private sources. Through funding and policy arrangements Federal and State governments in Australia invest or facilitate more than $2 billion a year into the system, but there is no overall plan for this effort. The opportunity exists to establish a framework that embodies settings to encourage growth in the interface between industry and research and drive trust and collaboration across the agrisystem. This in turn should also incentivise greater private investment in R&D.
So what?

Australia can become a provider of choice for agrisystem knowledge and innovation services on the global scale. We have a unique combination of circumstances that mean we specialise in high quality, consistent production despite resource constraints, seasonal variability and market volatility. Our skills and expertise will be in demand in a world that needs to feed more people using less resources, deal with variability and risk, and meet the expectations of a more demanding consumer class.

But our success is not assured and our competitors are moving quickly. Establishing the right conditions now will prepare us for the future. These conditions include building the settings that will increase the interface between researchers and industry, support collaboration across the value chain to develop synergistic opportunities for innovation and so, in turn, create a dynamic knowledge and innovation ecosystem.

The ecosystem should build and maintain a culture of intellectual curiosity to follow leads, and a can-do attitude to get things done and deliver impact. Researchers and investors will need to be willing to take risks and push the boundaries of what is possible, with investment and activity addressing short, medium and long-term challenges. The national and state governments need to focus on ensuring policy settings at all levels are supportive of the future ambitions for the agrisystem and the knowledge and innovation ecosystem.

The development of a new national framework provides the opportunity to articulate shared goals that can focus and drive efforts at the agrisystem and knowledge and innovation ecosystem levels.

Benefits

| Producers | • Capacity to adapt and respond  
|           | • Potential access to growth markets  
|           | • Production optimisation and de-risking  
|           | • New sources of investment  
|           | • Greater resilience  
|           | • Satisfaction of creation/production – farming as a service  
|           | • Diversity of opportunity at enterprise and production levels |
| Consumers | • Improved food production, quality and supply  
|           | • Counter seasonality (northern hemisphere consumers)  
|           | • Product assurance, quality and traceability |
| Researchers | • Global engagement  
|            | • Improved collaborative opportunities through prioritisation and alignment  
|            | • Greater opportunities for career advancement  
|            | • Reduced duplication of effort and maximisation of targeted outputs |
| Investors | • Reduced risk through meeting/managing community expectations  
|           | • Improved investment conditions and opportunities  
|           | • Reducing volatility and risk  
|           | • Long-term investment – capital returns  
|           | • Established, mature connections, supply chains, value chains |
| Policy makers | • Improved regulatory, governance and institutional arrangements  
|              | • Greater economic outputs and leverage  
|              | • Support for communities, jobs in rural and regional communities  
|              | • Food security  
|              | • Clearer, strategic rationale for policy making |
| The Community | • Regionalisation and attraction of a broad skill base across multiple professional services  
|              | • Social stability and security |
| The environment | • Reduced negative environmental impacts  
|              | • Improved environmental assets and conditions |
Now and for the future

Developing a vision for the future of rural innovation enables us to identify goals and objectives. This will guide strategy development and identify the skills we need to be successful. Governance arrangements are needed that provide for a strong alignment between organisational mandate and the interests of stakeholders. The right settings will support an effective system culture to emerge.

We should be ambitious in setting and achieving strategic goals for the agrisystem and the K&I ecosystem and aim to increase coherence and synergies between public and private sector investments. Effective collaboration is a must, with people and funding moving between organisations and priorities supporting a dynamic ecosystem.

**FIGURE: overlapping focus areas necessary for future success**

Efforts need to be made to purposefully design and implement governance arrangements and develop a culture to support us in monitoring our progress and achieving the results we want through an iterative improvement process. We need to ensure our people and organisations have the right mix of skills and capacities to maximise our chances of success.

Issues that are barriers to a more effective knowledge and innovation ecosystem need to be addressed and resolved. These include misalignment in incentives for researchers particularly around rewards and recognition for research effort, and conflicting approaches to the management and sharing of intellectual property.
Recommendations

**Develop and implement a new national framework to drive a globally-connected, high-performing and effective knowledge and innovation ecosystem**

A new, outcomes-driven approach is needed. Australia’s current arrangements for rural research, development and innovation have been successful, but an uplift of performance could be achieved by taking and implementing a systems approach. The framework approach should reflect the diversity of participants and connections between them, align efforts to national goals and embed effective governance arrangements. It should seek to find and optimise the synergies between the public and private sectors.

A range of organisations are already operating within the knowledge and innovation ecosystem. The skills, experience, capabilities and dynamic interplay between participants are strengths of the system, and these strengths should be built upon. Australia’s approach to rural research, development and innovation has been successful over years and decades, however, it was not designed nor has it been developed as an overall system.

A co-ordinating arrangement supported by appropriate and effective governance, aligned around agreed strategic purpose and vision, could broker, harness and leverage the combined energy and resources across the public and private sectors.

**Develop and implement a national, integrated, whole-of-government strategy for an enhanced agrisystem.**

The agrisystem crosses policy, portfolio and jurisdictional boundaries. No mechanism exists to bring the various influences together in a consistent and coherent way. A national, integrated approach is needed to encompass policy and investment settings across different levels of government and provide the necessary focus and rigour to identify and drive ambitious, strategic targets. Development of the strategy should incorporate an economic analysis of the agrisystem, and the influence and reach of Australian industry through global value chains.

The agrisystem covers as much as $800 billion of the Australian economy. There are separate and potentially conflicting policies for agricultural production, fisheries management, forestry, regional development, industrial development, research, development and innovation, education and training, health, regional infrastructure, energy systems (including renewables and biomass), land use, finance, investment and risk capital, and international trade and market access.

The Performance Review of Australia’s Rural Innovation System conducted by Howard Partners presented included an exploratory analyses of Australia’s bioeconomy, and of rural industries’ participation in global value chains. This work highlighted and demonstrated the usefulness of the concepts as a way into understanding future potential, but it did not address a range of detailed, technical challenges in developing this line of that would need to be confronted to deliver this mapping and measuring work. Such as analysis will be essential for defining the multiple growth pathways associated with enhancing the agrisystem and participation in global value chains. It should inform and underpin delivery of this recommendation.

| TABLE: Overview of recommendations to achieve our vision |
|-----------------------------------------------|-----------------------------------------------|-----------------------------------------------|
| Capability | R&D | Develop and implement a national framework to drive a globally-connected, high-performing and effective knowledge and innovation ecosystem | Knowledge and innovation |
| Approach | Problem solving, incremental | | Value chain transformation |
| Structures | Disjointed, ad hoc | | Coherent, consistent globally connected system |
| Intention | Production | Develop and implement a national, integrated, whole-of-government strategy for an enhanced agrisystem | Across the value chain |
| Focus, beneficiaries | Farmers and producers | | Communities, consumers, regions, producers, environment |
| Culture | Internally competitive | | Collaborative competition |
| Attention | Agriculture | Detailed analysis of the agrisystem and of Australia’s involvement in global agrisystem value chains, to identify opportunities for intervention and improvement | Agrisystem |
| Scale | $60 billion | | $800 billion |
APPENDIX 1 – the process

The Challenge
In March 2017 the Council of Rural RDCs was challenged by the then Assistant Minister for Agriculture and Water Resources Senator the Hon. Anne Ruston, and the Secretary for the Department of Agriculture and Water Resources Daryl Quinlivan, to provide some advice about the future. The Council agreed to take this on as a project.

Approaching the Task
Council addressed the challenge through a series of staged activities.

Stage 1 involved background research and analysis including perceptions and expectations of internal and external stakeholders.

Futurist and strategist Kate Delaney of John Robinson Consulting Services was commissioned to develop a series of scenarios that sketched out a range of potential futures. An overview of the scenarios is presented at Appendix 2.

Also during this time the national Research & Innovation Committee has undertaken a project to evaluate the current performance of the rural innovation system. A further and related piece was an analysis of the current growth trajectory of rural Australia’s industries. This project was led by AgriFutures Australia. Both of these activities have informed and provided context for the Council’s efforts.

Out of scope
This project did not assess current organisational arrangements, funding mechanisms, or performance. It did not address issues of current RDC composition or funding models. The RDCs are subject to regular and at times extensive review, and it was unlikely that additional work on these matters would reveal anything different to previous examinations.

Stage 1: Foundational work
1. Internal and External stakeholder research (July – August 2017)
2. Innovation Futures scenarios project (September 2017 – March 2018)
3. Rural Innovation System Performance Review (R&I Committee, August 2017 – June 2018)
4. Sector Growth Trajectory (AgriFutures Australia, December 2017 – May 2018)

Stage 2: Nature and direction
Workshop driven process to investigate and analyse key aspects of the nature and direction of the agrisystem and the knowledge and innovation ecosystem.

Stage 3: Next steps
Socialisation of the findings.
Analysis and consideration of implications
Stage 2: investigating the nature and direction of the agrisystem and knowledge and innovation ecosystems

Throughout the project the RDCs have been conscious of the need not only understand the future role and place of research and innovation for rural industries, but why this is a role for research and innovation as opposed to alternative approaches to reach the same outcomes.

In June 2018 the RDCs appointed Dr Gary Saliba, Strategic Journeys, to the task of developing a vision for the future of research and development in 2040, advancing Australia’s primary industries in the economy and community. This project was delivered largely with internal resources from within the RDCs, and each RDC was invited to nominate a key contact to be involved.

A series of workshops were held between July and September 2018 to address the two aspects of the task, to investigate and understand the future research, development and innovation ecosystem and, to investigate and understand the operating context that the research, development and innovation ecosystem would respond to.

Understanding the RD&I ecosystem

26, 27 July 2018: • Exploring the implications of different futures for RD&I.

13, 14 August 2018: • Review implications for learnings and insights.  
                     • Initial draft of the nature and direction of the RD&I system

20, 21 August 2018: • Understanding the RD&I ecosystem by mapping the dynamics. (with external participants)

30, 31 August 2018: • Review maps for learnings and implications.  
                     • Refine the nature and direction statement for the RD&I ecosystem.

Understanding the operating environment

13, 14 September 2018: • Review major factors and drivers for the RD&I operating context (the agrisystem)  
                         • Identify implications for the system (with external participants)

20, 21 September 2018: • Draft nature and direction statements for Australia’s agrisystem

27 September 2018 : • Review and refine the nature and direction statements for the RD&I ecosystem using the nature and direction statement for the agrisystem for the RD&I ecosystem

28 September 2018: • Testing concepts and package with the RDCs

Quick facts:
• 69 people engaged in total, 33 from within the RDCs, 33 other participants, 3 support personnel  
• Total 179 person days of engagement, including 101 person days from the RDCs and 42 person days by people outside of the RDCs  
• Findings presented to the Council of Rural RDCs in October 2018
APPENDIX 2 – Four Scenarios

The CRRDC Rural Innovation Scenarios

The scenarios used in this project were developed by Kate Delaney of John Robinson Consulting Services.

This activity began with a question ‘What is the future of rural innovation?’ The Council of Rural Research and Development commissioned these scenarios to think robustly about existing and emerging developments that will affect the future.

The scenarios canvased four alternative stories about the future of rural innovation. A brief overview of the scenarios is also available in video format. As one input into a broader strategy creation process, the scenarios are not as important as the conversations they generate about future possibilities.

The scenarios were based upon the combination of two factors:
• Economic complexity
• Risk appetite

This lead to four plausible futures.

Innovation Unleashed

In this future Australia has become a food and fibre global innovation hot spot, outdistancing some of the previous powerhouses of innovation like the United States. The purpose of innovation has shifted from ‘innovation for growth’ to ‘innovation for well-being’.

The Techno-fixers

In this future, where the control of technology is undemocratic (in a few hands), we are technology takers. We conflate technological advancement with innovation. We don’t ask questions about what we really want out of technologies and we don’t value understanding the ‘big’ questions.

The Domino Effect

In this future several ‘small’ events come together in surprising ways, leading to confusion and difficulty in dealing with problems. It’s very difficult to stop the falling dominoes and Australia is quickly pushed into a danger zone.

The Black Swan

In this future … Australia is faced with a black swan event, like the loss of crop pollinators. We’d be very different coming out the other side of the event … new politics, new attitudes and a healthy respect for our ecosystems change how we make food and fibre.

A more extensive report and short videos describing the scenarios is available through the Council’s website at www.ruralrdc.com.au.
APPENDIX 3

4. Performance review of the rural innovation system (unpublished)
   One in seven Australian jobs (1.6 million) are in the farm-dependent economy, and food and beverage processing employs around one-third of all Australian manufacturing workers, with promising growth prospects.
7. ABARES Report p5
8. ABARES/GRDC Report, p9, table 1
   *returns to RD&E
9. Productivity Commission update
   Efficiency gains through new technologies and farm management practices, achieved on the back of research and development, have enabled Australian agriculture to stay a step ahead of our international competitors – returning average productivity growth of 2.7% a year over a 30-year period.
11. ABS, 4627.0 – Land Management and Farming in Australia, 2016-17
12. ABS 1345.0 – Key Economic Indicators, 2018