

PERFORMANCE REVIEW OF THE RURAL INNOVATION SYSTEM

RESEARCH REPORT 2: PREVIOUS POLICY STATEMENTS, REVIEWS, INQUIRIES

7 June 2018

1	INTRODUCTION	1
2	SUMMARY OF ISSUES IN REPORTS	1
	MARKET AND TECHNOLOGICAL OPPORTUNITIES	1
	BARRIERS TO EXPLOITING MARKET AND TECHNOLOGICAL OPPORTUNITIES	1
	INADEQUATE INVESTMENT IN RESEARCH	2
	REDUCED PUBLIC SECTOR SUPPORT FOR EXTENSION	2
	SLOW RATES OF PRODUCTIVITY GROWTH	2
	INSUFFICIENT PRODUCT DIFFERENTIATION	2
	LIMITED VALUE-ADDING AND PARTICIPATION IN GLOBAL VALUE CHAINS	2
	HUMAN RESOURCE CONSTRAINTS	2
	LOW RATES OF UPTAKE OF NEW TECHNOLOGIES	2
	QUESTIONING THE SOCIAL LICENCE TO OPERATE	2
	IMPACTS OF CLIMATE CHANGE	2
	INADEQUATE INFRASTRUCTURE AND SERVICES	2
	LACK OF SUPPORT FOR THE DEVELOPMENT OF SPECIALIST SUPPLIERS	3
	INAPPROPRIATE RESEARCH GOVERNANCE	3
	FOREIGN INVESTMENT	3
3	REPORT SUMMARIES	3
	AUSTRALIAN ACADEMY OF SCIENCE, 2017 <i>THE DECADAL PLAN FOR AUSTRALIAN AGRICULTURAL SCIENCES: GROW. MAKE. PROSPER.</i>	3
	CSIRO FUTURES, 2017. <i>FOOD AND AGRIBUSINESS: A ROADMAP FOR UNLOCKING VALUE-ADDED GROWTH OPPORTUNITIES FOR AUSTRALIA.</i>	4
	FOOD INNOVATION AUSTRALIA LTD, 2017. <i>FOOD AND AGRIBUSINESS GROWTH CENTRE, SECTOR COMPETITIVENESS PLAN.</i>	5
	AUSTRALIA, 2017. <i>INVESTMENT OPPORTUNITIES IN AUSTRALIAN BUSINESS AND FOOD.</i>	6
	ABARES, 2017, <i>RURAL RESEARCH, DEVELOPMENT AND EXTENSION INVESTMENT IN AUSTRALIA.</i>	7
	COUNCIL OF RURAL RESEARCH AND DEVELOPMENT CORPORATIONS, 2017, <i>CROSS RDC COLLABORATION INVESTMENT REPORT</i>	8
	CHIEF SCIENTIST, 2016. <i>THE AUSTRALIAN GOVERNMENT'S SCIENCE AND RESEARCH PRIORITIES.</i>	8
	AUSTRALIAN FARM INSTITUTE, 2016. <i>THE IMPLICATIONS OF DIGITAL AGRICULTURE AND BIG DATA FOR AUSTRALIAN AGRICULTURE</i>	9
	CHIEF SCIENTIST, 2016, <i>THE NATIONAL RESEARCH INFRASTRUCTURE ROADMAP.</i>	10
	AUSTRALIAN GOVERNMENT, 2015. <i>AGRICULTURAL COMPETITIVENESS WHITE PAPER - STRONGER FARMERS, STRONGER ECONOMY</i>	10
	OECD. (2015). <i>INNOVATION, AGRICULTURAL PRODUCTIVITY AND SUSTAINABILITY IN AUSTRALIA</i>	12
	THE AUSTRALIAN COUNCIL OF LEARNED ACADEMIES 2015. <i>AUSTRALIA'S AGRICULTURAL FUTURE.</i>	12
	CSIRO AND RIRDC, 2015. <i>RURAL INDUSTRY FUTURES: MEGATRENDS IMPACTING AUSTRALIAN AGRICULTURE OVER THE COMING TWENTY YEARS.</i>	13
	BUSINESS COUNCIL OF AUSTRALIA, 2015. <i>BUILDING AUSTRALIA'S COMPARATIVE ADVANTAGES: A 21ST CENTURY AGRIFOOD SECTOR</i>	14
	ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING (ATSE), 2014. <i>FOOD AND FIBRE: AUSTRALIA'S OPPORTUNITIES.</i>	15
	NATIONAL FARMERS FEDERATION, 2013, <i>BLUEPRINT FOR AUSTRALIAN AGRICULTURE 2013-2020.</i>	15
	DEPARTMENT OF AGRICULTURE, FISHERIES AND FORESTRY 2013, <i>NATIONAL FOOD PLAN, OUR FOOD FUTURE.</i>	17
	MINISTER FOR AGRICULTURE, FISHERIES AND FORESTRY, 2012. <i>RURAL RESEARCH AND DEVELOPMENT POLICY STATEMENT.</i>	17
	PRODUCTIVITY COMMISSION, 2011, <i>RURAL RESEARCH AND DEVELOPMENT CORPORATIONS.</i>	17
	RURAL RESEARCH AND DEVELOPMENT COUNCIL (2011), <i>NATIONAL STRATEGIC RURAL RESEARCH AND DEVELOPMENT INVESTMENT PLAN</i>	18
	DEPARTMENT OF AGRICULTURE, FORESTRY AND FISHERIES, 2002. <i>NATIONAL FOOD INDUSTRY STRATEGY: AN ACTION AGENDA FOR THE AUSTRALIAN FOOD INDUSTRY.</i>	19
	SUPERMARKET TO ASIA STRATEGY, 1996.	20
	REFERENCES	21

1 Introduction

There have been many significant and substantial reports on rural industries, and innovation in those industries, over the past decade. These reports, from a range of organisations, cover many specific topics. This note focuses largely on major reports by or supported by government or government-related organisations and aims to summarise the key points they raise.

An awareness of the significance of rural industries for economic, social and environmental development in (Leonard et al., 2017) Australia informs all these reports.

The reports are also motivated by, and seek to raise, an awareness of the strong currents of change that are reshaping if not transforming rural industries: changing patterns of market demand; new trajectories of technological innovation; shifts in the knowledge base for production and innovation; declining public support for RD&E; climate change; structural change as the number of farms declines.

Most of the reports are concerned, explicitly or implicitly, with whether Australia's rural innovation system¹ is addressing, and has the capability to adequately address, the opportunities and challenges it faces. Is it continuing to evolve and strengthen so that it is 'fit for purpose'? Does it stimulate and support innovation across rural industries? If there are weaknesses and gaps in performance or capability, what are the priorities for action to address these?

In the second part of this note, we provide a brief overview summary of the issues raised in the report. The third section summarises the key conclusions and recommendations of the reports.

2 Summary of Issues in Reports

Australia's GDP in 2017 stood at \$1.69 trillion. ABARES has reported that that agricultural output in 2016-17 was \$63.8 billion, thus contributing 3.8 per cent to GDP. Rural industries (agriculture, fisheries and forestry) account for over 15% of Australia's merchandise exports. They are vital for maintaining employment and communities across rural and regional Australia.

Less than 30% of farms (generally the larger and more profitable farms) account for 70% of output. There is little discussion in the reports of the implications for RDC research priorities of the widening gap between the interests of the leading and laggard producers. A long history of innovation lies behind the export success and productivity of these industries. They are increasingly technology-intensive and draw on a widening knowledge base.

Market and Technological Opportunities

Due to increasing market and technological opportunity there is a strong potential for sustained growth in output, product diversity and profitability.

The growth of market opportunity is driven largely by the growth in the number of wealthier consumers, particularly in Asia. Associated changes in demand preferences place a premium on higher protein foods (such as animal products) and on foods differentiated by quality, traceability and provenance.

Multilateral and bilateral trade agreements have increased access to markets and continue to be important for increasing that access. As competitive pressure from other suppliers will continue to increase, sophisticated marketing and strong value chain relationships – in addition to product quality and responsiveness to customer demand – are essential for pursuing these compelling market opportunities.

Increasing technological opportunity is driven by, in particular, the development and increasingly wide applications of transformational technologies. Digital technologies and biotechnology are enabling 'game changing' innovations. They often provide routes to productivity improvement that address otherwise difficult problems that limit performance, for example, labour scarcity, a need for pest control with reduced use of agricultural chemicals, differentiation through enhanced product attributes, more effective use of expensive inputs.

Barriers to Exploiting Market and Technological Opportunities

The reports identify a wide range of barriers and impediments, and the emphasis varies across reports.

¹ The firms and organisations in the public and private sectors, the relationships among them, and the policies and institutions that shape their role in the creation, import, diffusion and application of knowledge.

Inadequate investment in research

A declining proportion of Australia's investment in R&D has been allocated to agriculture. Research intensity (the ratio of public investment in R&D to gross agricultural domestic product) has more than halved over the past 20 years. Australia's share of international agricultural publications has steadily declined over the past 20 years. Public R&D investment in agriculture has declined in real terms over the past 10 years.

Responding to the widening frontier of technological opportunity will require a substantial increase in R&D investments, often in new areas of knowledge, such as digital technologies – in the context of an integrated strategy for industry development.

Reduced public sector support for extension

Most State governments have reduced their role in rural extension and many farmers rely on suppliers and fee-for-service advisors for advice.

Slow rates of productivity growth

Rates of productivity improvement in some sectors have remained low since the mid-1990s. However, the Productivity Commission (2011) reports that overall agricultural productivity growth rates have changed little over decades.

Insufficient product differentiation

With increasing competition, product differentiation - based on quality and branding with traceability and provenance to support sustainability and ethical production claims – will be increasingly important in winning market share and enabling premium pricing. There is little analysis in the reports of the proportion of exports that could be higher value-added products and how higher levels of value adding can be developed.

Limited value-adding and participation in global value chains

While bulk commodities will be likely to account for the major share of Australia's agricultural exports, the increasing scope for value added products will require the development of deeper market knowledge and more extensive links with marketing agencies and distributors

Human resource constraints

While the education level of farmers and operators is improving, evidence suggests that current education levels contribute to slow uptake of new technologies and a wide range of productivity levels. The demand for agricultural science graduates exceeds supply. The early career opportunities for agricultural science researchers and the financial support during post-graduate study are strong disincentives for this career choice. With increasing and changing skill and knowledge requirements a lack of appropriate human resources could be serious constraint on innovation and productivity growth.

Low rates of uptake of new technologies

While many farmers are innovative, inadequate skill and knowledge among some farmers and operators has led to slow rates of uptake of new technologies. With the increasing capital intensity of operations access to capital will often also be a constraint on investment in new technologies.

Questioning the social licence to operate

Community concerns regarding sustainability, food safety and animal welfare have undermined the 'social licence to operate', led to increased regulation, and diminished the attractiveness of careers in rural industries.

Impacts of climate change

Long term changes in weather patterns will impact the viability of current land use in some areas. Increasing variability of rainfall, temperatures and wind will threaten the viability of particular industries in many areas and at least require changes in species, practices and infrastructure.

Inadequate infrastructure and services

While transport infrastructure is limited in many areas, inadequate digital connectivity is likely to become a serious barrier to the uptake of digital technologies. The relative decline in profitability of many rural enterprises,

the shrinking rural workforce and the reduction in the number of rural enterprises erodes the viability of many small communities and consequently reduces the accessibility of health, education and other services.

Lack of support for the development of specialist suppliers

While specialist suppliers of equipment, inputs and services will have a vital role in innovation and in marketing there are few policies or programs to support the development of the Australian supply sector. Some agri-tech firms have gained support through general entrepreneurship support programs.

Inappropriate research governance

As a result of the governance structures agricultural research is increasingly allocated to short term – near to market - objectives. The governance arrangements limit the scope for long-term (potentially) transformative research, the types of inter-disciplinary research that are increasingly required to enable the more complex ‘whole of system’ change, collaboration among researchers and coordination both of research investments and of participation in international research.

Due to the widening knowledge base for innovation in rural industries the linkages between the agricultural innovation system and the national innovation system are of increasing importance.

Foreign investment

Foreign-owned or joint venture operations account for a small number of rural enterprises. Foreign investment is an important source of the capital that will be required to invest in upgrading farms and related operations. Foreign investment can also contribute to knowledge transfer and to stronger links into global value chains.

3 Report Summaries

Australian Academy of Science, 2017 *The Decadal Plan for Australian Agricultural Sciences: Grow. Make. Prosper.*

The purpose of this Decadal Plan for Agricultural Sciences is to identify actions that will position Australia’s agricultural sector to take advantage of major scientific and technological advances. It aims to:

- provide strategic direction to Australia’s future investment in agricultural sciences
- provide a strategic framework with which researchers can align and coordinate their efforts to leverage greater impacts
- identify workforce needs and strategies that enhance career pathways for relevant scientists.

The report emphasises the fundamental role of agriculture. “Producers have stewardship of more than 60% of Australia’s land mass, and the industry directly employs more than 307,000 workers—the biggest employer in rural and regional Australia. About 1.6 million Australians are employed in the complete agricultural supply chain including food manufacturing and processing, distribution and retail. Agriculture supports population decentralisation, provides the ‘life-blood’ and social fabric of inland Australian settlement, and the industry acts as a source of skilled labour for mining and other industries.”

The plan recognises that agricultural research is not a core scientific discipline in its own right, but rather the confluence of many different scientific disciplines.

The plan identifies the major drivers influencing the development of agriculture and also identifies specific research areas that present strong opportunities in the medium to long term. It argues that education, career development and retention of top-class researchers will be essential to ensure that the required capabilities exist. It also argues that ensuring the required capabilities and research will require coordinated Australian research to prioritise and sustained funding.

On the basis of extensive consultation, the report identifies six specific research areas that are considered most likely to contribute to the advancement of Australian agriculture:

1. development and exploitation of genomics
2. agreed intelligent technologies
3. big data analytics
4. clever chemistry
5. coping with climate variability and change
6. metabolic engineering

And that the integration of these activities will see four major science-based outcomes:

1. increased productivity through integrated farm systems
2. enhanced bio security
3. maintenance of a sustainable resource base
4. increase value through quality and market advantage

CSIRO Futures, 2017. Food and Agribusiness: A Roadmap for Unlocking Value-Added Growth Opportunities for Australia.

This assessment for the Industry Growth Centres, Food Innovation Australia Ltd (FIAL), provides a valuable perspective, making a persuasive case for greater innovation, coordination and collaboration. Among the important perspectives are the points:

- Recently, and for the first time in Australia’s history, value-added foods have accounted for the majority (60%) of food export growth (data for the 3 years to 2016, Austrade);
- However, the sector is traditionally commodity based, with bulk commodities making up 88% of Australia’s food and beverage exports.
- Australia’s F&A sector is a small player in the global trade of food and beverages, accounting for only 2.2% of global food trade in 2014.
- Value-adding typically falls under two categories: **Processing** (through transformation using manufacturing processes); or **Method of production** (differentiation, by type of production or type of product, eg organic or selected variety).
- Australia’s F&A sector could develop to become as a small but significant exporter of sustainable, authentic, healthy, high quality and consistent products – but achieving this will require significant change in culture, capabilities and relationships.
- At present, Australia’s *clean and green brand* is well regarded but is not unique and is poorly differentiated

Several megatrends that are shaping consumer preferences and industry trends are significant for product innovation: **A Less Predictable Planet** (climate change; resistance in pests and diseases), **Health on The Mind** (rising demand for foods providing health benefits), **Choosy Customers** (wealthier consumers demand greater variety and convenience), **One World** (with convergence in markets food value chains are more global and competitive), **Smarter Food Chains** (rising demand and the application of digital technologies is driving leaner, faster, more agile and low waste value chains)

The overwhelming majority of food and agriculture businesses are **not** oriented to pursuing new markets, investing in building capability and taking managed risks.

The comparative advantages of the food and agriculture sector are significantly qualified by challenging disadvantages, as outlined below:

Comparative advantages	Comparative disadvantages
Clean and green Strong reputation Low prevalence of food-borne illness High safety standards Unique geography Close to growing Asian markets Diverse range of agroecological zones Counter-seasonality to Northern Hemisphere World class research Strong R&D sector, especially in ag. science Established sector with a global mindset Strong knowledge, skills and infrastructure base Globally focussed industry Free Trade Agreements High proportion of SMEs Fast, agile and high innovation potential	Lacks uniqueness Disparity between perception and performance Extensive list of accreditation schemes High transport costs Small and geographically dispersed domestic market Disconnect between producers and processors Poor conversion / commercialisation Relatively low business expenditure on R&D Exposure to global fluctuations Complex regulatory arrangements Difficult to generate scale Most Australian SMEs are micro

The assessment identifies a range of opportunities for the food and agriculture industry and its suppliers. It then identifies five 'growth enablers' and suggests actions, at the technology development, individual business and innovation ecosystem level, to respond: traceability and provenance, food safety and biosecurity, market intelligence and access, collaboration and knowledge sharing, skills levels in the industry

Food Innovation Australia Ltd, 2017. Food and Agribusiness Growth Centre, Sector Competitiveness Plan.

This plan was developed in response to the Commonwealth Government identifying the Food and Agribusiness sector, along with five others, as a key priority sectors under the Industry Growth Centres Initiative. The plan outlines a ten-year vision and strategy for the industry.

The plan recognises that the Australian food and agribusiness industry is highly fragmented and operates in a diverse, dynamic, and complex landscape. The sector spans growers, raw material producers and manufacturers to packaging, sales, marketing and retail providers, through to final users or consumers of the sector outputs. Based on ABS statistics, the sectors commercial characteristics are identified as:

Sales and Service Income	\$164 billion in total sales and service income, equivalent to 5.9 per cent of all Australian industries in 2013-14.
Value Added	\$59.1 billion of industry gross value added in 2015-16, equivalent to 3.6 % of GDP.
Exports	Exports of \$37.7 billion representing 14.8% of all Australian exports in 2016.
Businesses	Total of 177,200 businesses in 2016, of which 121,341 were non-employing (representing 67.8% of total businesses).

The Plan focuses on all innovation and value adding activities along the food and agribusiness value chain. Products are produced as commodities are excluded.

The strategic analysis behind the plan concluded that at the heart of the challenges facing the Food and Agribusiness industry are the culture, beliefs and values that underpin the businesses in the industry. The analysis identified a sectoral landscape shaped by two distinct types of businesses:

- *Businesses of Today*- mostly retailers and MNCS, generally less growth-orientated, more domestic-market focused or see involvement in overseas markets as outside their scope. These businesses dominate the landscape dynamics and shape the industry culture, are hesitant to engage, cooperate and collaborate with SMEs and other stakeholders and so make it difficult to create a collaborative culture that fosters and encourages high growth and ambition.
- *Businesses of Tomorrow* - Actively pursue new markets and are more inclined to take risks to secure those new markets, are directly connected to their end markets and continuously invest in building both their capability and knowledge of these markets. It is estimated that out of the approximately 57,000 employing businesses in the industry, only 5%, or 3,000 businesses, are in this category.

The strategic analysis also concluded that the development of the sector is hindered by:

- misalignment between the federal, state, local and regional levels of government in the provision of services to build the capability and competence of the industry
- poor research–industry interaction.

The plan concluded that growth can be pursued through accessing new markets and by raising competitiveness, but to achieve this change is required. The priority development goals and the related actions are summarised below:

Sectoral Development	Priority Actions
<p>Capable firms: Industry players have the confidence and capacity to use their knowledge, resources, skilled workforce and capabilities to develop innovative, cost-effective and differentiated offerings for the Australian and international markets.</p>	<ul style="list-style-type: none"> • Identify businesses with a motivation to grow and desire to be a 'business of Tomorrow'. • Build knowledge platforms for collecting and sharing technology, regulatory challenges, and market insights. • Develop capability building programmes to ensure there are more 'boundary speaking gatekeepers' to reduce the industry–research divide.

Sectoral Development	Priority Actions
	<ul style="list-style-type: none"> • Develop channel readiness programmes, to up-skill the workforce on innovation, business models, market channels and supply chains. • Support Food and Agribusiness incubators and accelerators
Culture of collaboration: Develop a culture of connected, collaborative industry participants who desire transformational change, and continue to proactively seek and utilise collaborations for national and international market and supply chain success.	<ul style="list-style-type: none"> • Develop collaboration among firms to support investment and innovation. • Establish a network of clusters. • Establish new research and commercialisation metrics, around engagement and collaboration, and outcome driven research to encourage linkages.
Industry leadership: Develop a cohesive and clear voice of industry, influences and shapes policy, and identifies opportunities for regulatory reform that fosters industry-wide innovation and entrepreneurship, in partnership with government.	<ul style="list-style-type: none"> • Establish effective working relationships and mechanisms for being the voice of industry to government (federal and state), and vice versa. • Encourage and optimise the alignment and effectiveness of government instruments, i.e. policies, free trade agreements and so on.

In view of the high level of fragmentation in the sector, the plan focuses on approaches to build economies of scale in market knowledge, manufacturing, and infrastructure in order to:

- support those businesses with the desire to develop the confidence to acquire the capabilities and capacity necessary to transition from a ‘business of Today into a business of Tomorrow’;
- ensuring the large number of SMEs, in aggregate, have the scale and capability to realise significant results through greater capability development, alignment, co-operation and collaboration across the industry, research organisations, and government support programs.

The FIAL plan identifies 16 challenge areas, together with expected value in 2015 and expected value in 2025.

Challenge area	Expected value 2015		Expected value 2025	
	Low	High	Low	High
Soil health and land management	30	70	65	85
Animal feed additives	40	45	75	90
Food safety	45	60	60	90
Sustainable inputs	25	25	105	110
Sustainable aquaculture	185	185	240	240
Urban agriculture	135	290	185	395
Energy smart food	135	265	250	785
Food waste	40	40	465	780
Reducing packaging waste	5	5	10	80
Advanced breeding and fertilisation	45	45	125	125
Precision agriculture and big data	35	45	110	135
Supply chain transformation	30	40	135	200
Direct to consumer models	65	80	160	195
Targeted eating	345	360	695	770
Health and wellness	2,550	2,550	3,400	3,400
Global consuming class	1,255	1,635	2,730	3,640
Total	4,965	5,740	8,810	11,120

Austrade, 2017. *Investment Opportunities in Australian Business and Food.*

This report provides a detailed perspective on Australia’s rural industries, their commercial performance and the foundations of their competitiveness.

The report emphasises the export performance of Australian agriculture, from commodities to premium goods. It notes the strong history of agricultural and food R&D that has fostered a knowledge-based agriculture, based on:

- success in farming the world’s driest inhabited continent, through technology innovation and ability to adapt production systems
- excellent agricultural R&D – Australia’s plant, animal and agricultural scientists rank among the best in the world
- expertise and strength in human health and nutrition research
- robust regulatory protection with consistent standards in quarantine, food safety and food labelling.

- International investment in Australia's agriculture and food is growing as Australia capitalises on the high demand for its safe, premium food products and creates stronger ties into regional supply chains.

The report identifies types of investment opportunity in all major sectors:

Grains:

- securing strategic supplies of high-quality grains for global sellers
- alignment of supply chains between farm and end users to deliver exact specifications
- co-investment to commercialise grain technologies such as new varieties
- improving storage and handling infrastructure through co-investment
- purchase of farmland assets cable high yielding returns
- development of just-in-time supply chains for niche premium customers

Beef:

- investing in northern farm infrastructure to improve stocking rates
- developing integrated supply chains through joint ventures to supply growing export markets
- commercialising processing and product technologies to improve cost competitive delivery
- developing value-added meat exports based on grass fed, organic and provenance attributes
- commercialising world leading sensing and objective measurement technologies in processing improve cost competitiveness of supply chains

Dairy:

- farmland investment for capital gain at prices that represent a relatively low barrier to entry
- development and consolidation of dairy farms to improve productivity
- developing dedicated supply chains offering milk to product specification and delivering traceability
- co-investment to combine cost competitive primary production, leading processing technologies and export market access
- developing specialty products with existing manufacturers for high-value target markets

Horticulture:

- driving consolidation of small farms through acquisitions
- development of new production regions in northern Australian
- development of covered production systems to minimise climate risk and ensure continuity of supply for domestic and regional markets
- development of convenience products to capture value and minimise wastage
- investing in local production to replace imports of high-value products
- exporting high fresh products to affluent Asian markets
- investing in technologies to reduce processing costs and improve export capability

Aquaculture:

- investment opportunities development of designated aquaculture zones providing an investment ready platform
- consolidation of small producers to improve competitiveness
- integration of production, processing and marketing supply retail ready products for domestic and overseas markets
- development of supply chains to replace imported seafood products with locally farmed seafood products
- development of convenience products for growing local market.

ABARES, 2017, Rural research, development and extension investment in Australia

Authored by Niki Millist, Will Chancellor and Tom Jackson Research Report 17.11, Australian Bureau of Agricultural and Resource Economics and Sciences

Recognising the complexities in the flow of funds among the many actors in the RD&E systems, ABARES estimate that funding for rural R&D (including public and private investment and covering agriculture, fisheries and forestry, sustainable production and agricultural inputs and processing R&D) increased from \$2.6 billion in 2005-6 to \$3.3 billion, in real terms, in 2014-15. The strongest growth was from private funding - investment by private firms in their own R&D, nearly doubled over this period and by 2015 accounted for 40% of overall R&D funding.

The other major sources in 2015 were industry levy payments to the RDCs (9%); Commonwealth funding (27%); universities (12%); States and Territories (8%).

An additional \$316 million of funding was used in 2014–15 to support extension, of which about 43% was private funding. Public sector funding for extension declined over the five years from 2005-06, but increased over the five years to 2014-15.

Council of Rural Research and Development Corporations, 2017, *Cross RDC Collaboration Investment Report*

The purpose of this briefing paper, prepared by Leecia Angus Consulting, was to provide a stocktake of cross-RDC collaboration where RDCs co-invest with each other.

The background is the perception that the RDCs are weak in being able to appropriately resource and prioritise collaborative, cross-sectoral R&D, and, as a result, cross-sectoral RD&E suffers from underinvestment and a lack of coordination. The report notes that Government calls for the RDCs to collaborate, particularly on cross-sectoral issues, have been increasing in their intensity over the past decade. It notes also that the Productivity Commission described investment in areas of cross-industry R&D as a type of 'market failure' amongst the RDCs. The PC's view was that successful 'across industry' rural R&D initiatives need collaboration between the various interests to ensure their objectives are relevant and their outcomes can be transferred to or used by the relevant industries.

This stocktake found evidence of collaboration between the RDCs including sharing information, sharing investment intentions for some RD&E themes and co-investing in projects. Co-investment was sometimes (49 of 88 projects) through a lead RDC arrangement and in other cases the co-investment is through independent funding agreements with the provider (typically in areas such as biosecurity, AgVet chemicals and invasive animals). The report suggested that the Rural R&D for Profit program is influencing the RDCs to co-invest together. All 15 of the RDCs are participating in the accelerating precision agriculture to decision agriculture, but not all are making financial contributions to it.

The report suggested that there are avenues for RDCs to engage levy payers on cross-sectoral issues, such as through Catchment Management Authorities, which have a board make-up of 50% of producers, and NRM Regions Australia and Landcare, which engage with producers as part of their community and industry engagement. These groups may offer an alternative to sectoral engagement for identifying needs and research questions.

Chief Scientist, 2016. *The Australian Government's Science and Research Priorities*

The Government has developed a set of Science and Research Priorities, and corresponding Practical Research Challenges, designed to increase investment in areas of immediate and critical importance to Australia and its place in the world.

The Science and Research Priorities and associated Practical Challenges are intended to ensure that appropriate levels of public funding are allocated to research that addresses the most immediate problems facing the nation. They are neither exclusive, nor are they exhaustive.

The implementation of priorities is expected, over time, to result in an increased proportion of Australian Government research investment allocated on a strategic basis to areas of critical need and national importance. This does not mean that funding should be directed to applied, mission-based research to the exclusion of other forms of research. Even in the priority areas, a significant amount of the research will need to be early-stage, basic research.

It is expected that addressing the Priorities and Challenges will require effort from across the full spectrum of research disciplines, including the physical and life sciences, engineering, information and communications technology and the humanities and social sciences. It will also require a coordinated approach from all Government departments and agencies.

Cross-cutting issues related to the priorities present challenges in their own right and will be addressed through a whole-of-government strategic approach. These include big data, research infrastructure, workforce and international collaboration.

The Science and Research Priorities and Practical Research Challenges will be reviewed every two years to allow for new initiatives to take effect and to ensure that issues being addressed are still the most pressing for the nation.

The priorities are in the areas of: Food; Soil and water; Transport; Cybersecurity; Energy; Resources; Advanced manufacturing; Environmental change; Health

<http://www.science.gov.au/scienceGov/ScienceAndResearchPriorities/Pages/default.aspx>

Australian Farm Institute, 2016. *The Implications of Digital Agriculture and Big Data for Australian Agriculture*

This report was prepared by the Australian Farm Institute with funding from Dairy Australia Ltd, Grain Growers Ltd, and the Cotton Research and Development Corporation. The report contains a detailed analysis of global developments in digital agriculture, and consideration of what will be needed in Australia to ensure that the undoubted benefits that are available are quickly brought into effect.

The report argues that agriculture is now undergoing its third major revolution, the digital agricultural revolution. The first was the mechanical revolution that occurred between the two world wars, the second was the scientific revolution, often referred to as the green revolution, which occurred over the period from the late 1960s to the late 1990s, and involve the application of well-developed size to the sector again resulting in significant pirate activity increases.

The digital revolution has been made possible by the dramatic reduction in the cost of digital and computer technology and the adaptation of this technology farm implements and farm monitoring applications.

While the potential impact and implication of the digital agricultural revolution are still quite unclear, they are rapidly developing. They are emerging to support farm management decisions, maintain and report on bio security issues, support quality assurance and credence systems, map and analyse land use in crop performance, monitor and manage water, and track markets and transact sales and purchases.

The analysis found that the development to date of digital agriculture was concentrated in the cropping sector, but that there are rapidly increasing applications in the livestock, horticultural and viticultural sectors. In all examples the main benefit of digital agriculture is the ability to make informed management decisions based on quantitative data at a much higher level of precision than was previously possible. The use of digital agriculture systems enables farmers to change from paddock and herd average management, to square metre and individual animal management, with reported subsequent increases in farm productivity. Gains of the order of 10% to 15% have been recorded in cropping systems.

The early indications are that the digital agricultural revolution will create very important opportunities for productivity gains, but will require life combination of scientific knowledge, computing applications, and human resource development in order for those gains to be realised.

The generation of digital information leads to questions about how the information should or can be stored, managed, and utilised in ways that enhance farm productivity and profitability.

What has emerged in the US is a commitment to open access data arrangements - data obtained from different types of machinery is able to be used on multiple different software platforms, and readily transferred between them. As a consequence, competition has emerged in the provision of data storage and management platforms in a competitive software market has also developed. These open access data arrangements permit farmers to transfer their data from one service provider to another with very little loss of functionality.

Data transfer in the US is aided by well-developed telecommunications infrastructure, which is lacking in Australia. Poor mobile communications networks and data transfer ability in Australia in some cases makes digital agriculture technologies expensive and practically unusable.

In Australia systems and platforms may not develop to the same extent as the US - this is because developments in the US have been based on the public availability of detailed soil maps, public access to high-density weather data, the presence of a comprehensive mobile telecommunications network throughout key cropping regions, and the presence of large-scale commercial agribusiness service providers that have been prepared to invest in the development of these systems.

Australian agricultural will benefit to some extent from the technology " spill-in" arising from developments in the US, with imported farm machinery now routinely equipped with a digital control and monitoring systems that have been developed in the US.

The report identifies a range of initiatives that can be adopted by the agricultural sector in Australia to facilitate a more rapid development of digital agriculture systems.

Report recommendations included the following:

1. Australian agricultural industries, Australian agricultural research agencies, and relevant IT, telecommunications and software organisations, collaborate in the establishment of the Australian digital agricultural forum, with the broad objective advancing the development and adoption of digital agricultural applications and systems in Australia

2. Australian agricultural industries, agricultural technology providers, and digital agricultural platforms and software system providers should adopt as a key principle that the farmers who own the land or livestock from which digital agricultural production data is obtained, retain ownership rights over that data.
3. There should be a commitment to open access protocols
4. Appointment of a farm data Ombudsman
5. Increase funding for soil mapping and weather recording stations, and actively investigate the potential for public/private investment models and private sector collaboration as a means of improving the soil and climate data sets that are an essential foundation of digital agricultural systems.
6. Increase funding to augment access to mobile telephone and data networks in rural and regional Australia, and actively investigate the potential for public/private investment models
7. Governments and the rural research and development corporations collaborate to develop a strategy to make the detailed data and relevant meta data associated with publicly funded research available in accordance with an open access data protocols and work towards standardising the availability of other relevant information about research trials

Publicly funded agricultural research organisations have a fundamental role in the generational knowledge to underpin digital agriculture application models and algorithms. They should not be involved in the development of commercial software programs or digital aquaculture platforms that will be used by farm service organisations or farmers. Private-sector digital applications and platforms have the potential to traumatically change the way farmers access production and other information to farm management decisions. These systems should become the principal information supply chain for farmers in future, and public-sector research agencies will need to develop new strategies that recognise these systems as the principal extension pathways of the future.

Chief Scientist, 2016, *The National Research Infrastructure Roadmap*

The 2016 National Research Infrastructure Roadmap outlines national research infrastructure required over the coming decade so that Australia's world class research system continued to improve productivity, create jobs, lift economic growth and support a healthy environment.

The 2016 Roadmap has identified the following nine focus areas that require ongoing support to ensure that Australia will be able to maintain its position as an emerging or established global leader

- Digital Data and eResearch Platforms
- Platforms for Humanities, Arts and Social Sciences
- Characterisation
- Advanced Fabrication and Manufacturing
- Advanced Physics and Astronomy
- Earth and Environmental Systems
- Biosecurity
- Complex Biology
- Therapeutic Development

The 2016 Roadmap was provided to Government in February 2017.

<https://www.education.gov.au/2016-national-research-infrastructure-roadmap>

Australian Government, 2015. *Agricultural Competitiveness White Paper - Stronger Farmers, Stronger Economy*

This 2015 policy statement was developed through submissions to an Issues Paper and a Green Paper.

The paper recognises:

- the increasing opportunities for agricultural exports, particularly of higher-value added, differentiated, products to middle class Asian consumers;
- the potential of the development and application of transformative technologies – and the need for communications infrastructure to support this;
- the need for investment, including foreign investment, and closer links with global value chains.

The statement identifies nine principles that shaped the policies:

1. Increases returns at the farm gate—by reducing costs and unnecessary barriers to productivity and profitability

2. Maintains access for all Australians to high-quality and affordable fresh food
3. Builds the infrastructure of the 21st century—to improve transport & communications linkages to domestic and international markets
4. Supports strong and vibrant regional communities
5. Keeps families as the cornerstone of farming—by establishing career paths based on financial stability, training and succession options
6. Creates well-paying jobs in agriculture, including in the downstream sectors of food manufacturing, food retailing and hotels and restaurants
7. Promotes access to key export markets
8. Reduces unnecessary regulation at all levels of government—to lower restrictions on farm management decisions and encourage investment
9. Focuses on Australia's competitive advantages so we are prepared to realise the food demand of the growing middle class in our region

The statement sets out a vision to “build a more profitable, more resilient and more sustainable agricultural sector to help drive a stronger Australian economy.”

It identifies five priorities:

1. A fair go for farm businesses, to keep families on the farm as a cornerstone of agriculture, by creating a stronger business environment with better regulation, healthier market competition, more competitive supply chains and an improved tax system.
2. Building 21st-century water, transport and communication infrastructure that supports efficient movement of our produce, access to suppliers and markets and production growth.
3. Strengthening our approach to drought and risk management, including providing the tools to facilitate more effective risk management by farmers and a long-term approach to drought that incorporates provision of enhanced social and community support farming families and rural communities, and business initiatives for preparedness and in drought support.
4. A smarter approach to farming based on a strong research and development system that underpins future productivity growth; and effective natural resource policy that achieves a cleaner environment as part of a stronger Australia.
5. Access to premium markets through the availability of a large number of premium export markets open to our produce and a strong bio security system maintains our favourable plant and animal health status.

Among a large range of specific funding commitments in a \$4 billion package, the major components were:

- \$500 million for developing the nation's water infrastructure
- \$100 million to extend the Rural R&D for Profit programme to 2021–22
- \$200 million to improve biosecurity surveillance and analysis
- \$100 million for pest and disease management.

Updated Rural RD&E Priorities were also developed through the consultation process that led to the Agricultural Competitiveness White Paper. State and territory ministers agreed to the Rural RD&E Priorities at the Agricultural Ministers' Forum on 20 May 2016. These priorities are:

- advanced 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;
- biosecurity, 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;
- soil, water and managing natural resources, 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; and
- 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 Rural RD&E Priorities are consistent with the national Science and Research Priorities announced in May 2015.

<http://agwhitepaper.agriculture.gov.au/SiteCollectionDocuments/ag-competitiveness-white-paper.pdf>

OECD. (2015). *Innovation, Agricultural Productivity and Sustainability in Australia*

The OECD Report, (OECD, 2015)

The Australian Council of Learned Academies 2015. *Australia's Agricultural Future*.

The focus of this report was on, primarily on-farm, issues that are likely to impact the capability of Australia's agricultural industries to respond to future increases in global demand, particularly in Asia.

Its major conclusions were:

1. Structural changes are creating policy challenges

- Australia's agricultural sector contains a wide variety of farms, including tiny life-style farms, long-run family farms, and large corporate farms, representing diverse business enterprises. (family-owned farms account for 95 per cent of farms and 77 per cent of farmland).
- Small family farm businesses are less able to access and adopt advanced technologies and may lack access to enough capital to underpin adaptation to (environmental, market, commercial etc) changes.
- Trends towards concentration, intensification and vertical co-ordination may reduce the role of small family farms and increase foreign ownership.
- Most of agriculture's economic value is produced by a minority of high-performing farms.
- Not all farms will be able to, or want to, respond to increases in global demand.
- Governments will need a variety of policies that recognise this heterogeneity and recognise potential unintended side-effects.
- Contemporary agricultural industries with strong participation in export markets have innovative partnerships between farmers, information providers and researchers and have more farmer-initiated innovation. Institutional structures need to be investigated to reveal better ways to catalyse these connections and relationships.

2. Comparative advantage, commodities and the increasing scope for higher value products

- Australian agriculture's comparative advantage will continue to be in the export of bulk commodities; high-value products will have niche markets with discerning consumers both domestically and internationally

3. Ensuring clean, green, sustainable and ethical.

- Australia's reputation for 'safe, clean and green' food is a major comparative advantage that needs to be sustained and underpinned by internationally recognised standards and certification.

4. Effectively addressing sustainable production and climate change

- In order to meet increased demand, the sector will need to efficiently manage its soil and water resources, including the risks associated with climate change and climate variability.
- Climate change presents significant long-term risks that need to be managed.
- R&D will be needed to provide transformational changes in productivity in the face of climate change.

5. Attracting skills and capital

- The sector will need to attract capital and skilled labour in competition with other sectors of the Australian economy.
- Future agricultural enterprises will rely more on automation, robotics and sophisticated data analysis, causing employment opportunities to shift towards more specialised knowledge, skills and training. The success of future farming will depend on the degree to which farming communities can attract these skill sets to regional and rural Australia.

6. Uptake of transformational technologies

- Improvements in productivity growth through increasing technology inputs and technical efficiency are necessary to increase production and profitability.
- Transformational changes in technology and practices, advances in genetics and moves towards knowledge-driven systems are some of the keys to advancing productivity growth.
- Accelerating the uptake of advanced technologies, communications and knowledge systems, and integrated workflows for decision making and planning, are critical for success along the whole value chain.

- Farms of the future will be unrecognisable. The most-profitable farms today already have greater access to modern, advanced technologies. Future farming will use knowledge-intensive systems that draw on technological developments in computing, engineering and data analysis.
- The greater complexity of the farming system, the integration of ‘big data’ and the expectation of more efficient communication along the value chain, means that the different players need more than ever to form networks to enable knowledge aggregation, analysis and exchange.

7. The need for greater investment in digital infrastructure in rural areas

- High bandwidth internet access and advanced ICT will be needed in rural areas to enable remote access to these skills which will continue to reside in predominantly urban populations. Farmers will also depend on real-time access to nationally consistent databases to underpin their environmental management.
- The need for a highly skilled and technically savvy workforce; adequate access to high-quality infrastructure, including transport and telecommunications; and access to appropriate investment and financing to enable change.

8. Investing in knowledge creation

- Ongoing investment in research and development, both private and public, is vital to underpin this uptake.
- A higher level of R&D investment is needed in these areas into the future to build on excellent returns on past investments.

9. Responding to impacts on rural communities

- Managing the interface between agriculture and community issues will be critical for the well-being of rural and regional Australia
- Rural and regional communities are under increasing stress because of low incomes, decreasing on-farm employment opportunities, reduced local access to services such as health and education, and high retail prices of nutritious food. Farm employment has declined to just 270,000 (2013–14), or 2.3 per cent of the nation’s workforce—half of what it was in 2000.

10. Responding to wider community concerns

- A range of community concerns with regulatory, social and political implications important to the future development of agriculture need to be acknowledged and managed sensitively. These include issues such as food safety, labelling, gene technology in plant and animal breeding, foreign investment and foreign workers, alternative land-use on pastoral leases and farm ownership.

CSIRO and RIRDC, 2015. *Rural Industry Futures: Megatrends impacting Australian agriculture over the coming twenty years.*

Stefan Hajkovicz and Sandra Eady

Research and Development Corporation (RIRDC) partnered with CSIRO to conduct a strategic foresight exercise on the future of Australian agriculture to 2035. The assessment considered geopolitical, economic, environmental, social and technological trends - megatrend occur at the intersection of multiple trends and shape trajectories of change with profound implications.

The assessment notes three important aspects of the context:

- Over the past 40 years farmers terms of trade have declined substantially while the real value of agricultural production has not increased significantly.
- Variability in returns to agriculture has increased significantly due to increased climate variability, volatile exchange rates and fluctuations in market demand.
- The trend to fewer, larger farms continues in response to the need for improved competitiveness. The family farm remains the most common ownership structure and it increasingly faces pressure to grow and to maintain efficiency.

The assessment identified five megatrends:

1. A Hungrier World	Increased demand for food in a context of resource constraints requires sustained productivity improvements.
2. A Wealthier World	Increasing wealth in Asian markets will change the level of demand and the preferences of consumers.

3. Choosy Customers	Consumer preferences are likely to emphasise health and ethical concerns and hence a concern about provenance.
4. A Bumpier Ride	Changes in the global climate, environmental systems and world economy which create new and potentially deeper risks for farmers - new and deeper levels of resilience are required to withstand shocks associated with climate change, environmental change and globalisation
5. Transformative Technologies	Advances in technology within the fields of digital, genetics and materials science will change the way food and fibre products are created. Farmers and fishers will increasingly have sophisticated tools to assist with decision making.

Business Council of Australia, 2015. *Building Australia's Comparative Advantages: A 21st Century Agrifood Sector*

The Business Council (BCA) study was developed in response to the identification of the potential of the Agrifood sector in previous studies of Australia's comparative advantage. This study was based on consultations within the sector and reviews of the available literature.

The report argues that the substantial opportunity to increase value-added food exports, particularly to increasingly wealthy Asian consumers, will require:

- The Government to shift its focus from agriculture to the broader agrifood sector;
- Businesses to build capability and adopt a global approach.

The report recognises that the highly productive agricultural sector, the 'well established R&D system' and a 'strong reputation for quality and safety' provide the foundation of competitiveness in the sector.

However, the report identifies significant challenges that the agrifood sector faces:

- the sector is fragmented;
- there has often been an adversarial, rather than collaborative, relationship within the supply;
- cost structures in food manufacturing are high by international standards;
- productivity in food manufacturing has fallen over the past decade.

Hence, the report concludes that:

- The sector also needs investment to drive innovation and to invest in new productivity-enhancing plant and technology; and
- needs to focus on value adding across the entire supply chain and reduce the domination of the production and export of bulk commodities;
- the focus should be on innovation, meeting the demands of the consumer, sustainable differentiation and niche and premium products.

The report recommends an extensive set of initiatives, around three themes:

1. Developing international markets

- Address non-tariff barriers in high value, high-growth markets
- Pursue further trade agreements
- Establish FTA implementation units
- Develop a national marketing strategy
- Build Asia capabilities

2. Encouraging business investment

- Restore FIRB thresholds for rural land and agribusiness to that of other sectors
- Utilise financial products to mitigate risk
- Strategic approach to planning and zoning
- Develop northern Australia Building competitiveness

3. Building the competitiveness of the sector

- Economy-wide reforms such as tax and industrial relations reform
- Facilitate market structures that support efficient scale

- Prioritise infrastructure investment to support growth
- Focus Productivity Commission inquiry into regulation on entire supply chain
- Expand Entrepreneurs' Programme to agriculture
- Provide access to skilled labour through visas
- Prioritise R&D through Industry Growth Centre knowledge priorities
- Use growth centre to drive collaboration
- Improve consumer understanding of genetically modified foods

Academy of Technological Sciences and Engineering (ATSE), 2014. *Food and Fibre: Australia's Opportunities.*

A Report of a Study by the Australian Academy of Technological Sciences and Engineering. Australian Research Council, Canberra.

This report is based on assessments and consultations largely among a small group of leading Australian agricultural researchers. The case for change is based on the view that:

- The projected growth of Asian middle class over the next decades is a major opportunity for Australian agriculture and agri-food industries-
- In particular there are growing opportunities to move up the value chain and increase exports of high-quality, high-value and branded food and fibre products;
- Due to resource (water and land) constraints and climate change, growth in output must come largely from productivity improvement while ensuring environmental sustainability;
- This will require a new investment in the agricultural innovation system from government and industry;
- It will also require a coordinated national vision and strategy for sustainable growth, and for marketing in order to refocus and reconnect, and improve coordination, within the innovation system.

The key findings and recommendations were

1. Develop a long-term strategy

- a long-term vision with a focus on export growth and high-value product development;
- create a high level agri-food and fibre forum to establish goals, guide the development of pathways and address impediments;
- Drive new investment, including investment from target markets;

2. Leverage Australia's competitive advantage through "Brand Australia"

- build and promote global brand recognition of Australia's food and fibre products. The Australian agricultural produce is some of the safest and highest quality of the world. To leverage this comparative advantage
- develop an accreditation system that guarantees the safety and quality of Australian grown and processed food

3. Improve Australia's innovative capacity

- to enable world-class research to be translated into innovative Australian agribusiness, with a focus on value-added Australia's agricultural innovation system must be focused, coordinated and well-resourced.
- impacts of significant recent changes in the innovation system should be assessed;
- there is scope to increase international research collaboration particularly with trading partners.

4. Enable collaboration and translation for value

- enhanced networks and connectivity nationally between researchers, growers and marketers is essential to build a more robust industry sector;
- global collaboration is important for enhancing research quality and sharing risks
- participation in international collaborative networks allow Australian small and medium enterprises to take advantage of greater opportunities to participate in global value chains.

National Farmers Federation, 2013, *Blueprint for Australian Agriculture 2013-2020.*

This Blueprint was developed by the National Farmers Federation (NFF) through extensive consultation with producers, their major suppliers (eg banks, and transport, rural services, retail and chemical companies), RIRDC,

DAFF, ABARES and others. The Blueprint aimed to identify the major issues and priorities shared across the sector, broad strategies to deal with them, suggest pathways for implementation and drive growth coherence and coordination of agricultural sector efforts into the future.

The Blueprint initially intended to have the assessment look out to 2050, but then it was realized that the level of uncertainty across many dimensions was too great and hence the recommendations that would be developed would lack focus.

Drawing on, inter alia, the findings of forums and surveys, and on input from the advisory group, the NFF identified seven themes for the plan:

1. Innovation and research, development, and extension

- Increase investment in R&D- (apart from a spike in investment in 2001, Australia has had little growth in real R&D investment since the mid-1970s),
- Improve access to new technologies
- Improve uptake of best practice

The assessment noted that the extension system required strengthening and suggested that collaboration and coordination among funders, and between funders and providers, may improve the efficiency of Australia's agricultural innovation and RD&E system.

2. Competitiveness

- Improve and upgrade critical infrastructure
- Facilitate better access to capital
- Reduce the cost of 'red tape' and compliance
- improve the balance and profitability of the supply chain
- Build 'Brand Australia'
- Improve tools for coping with volatility of commodity prices/terms of trade
- Improve tools for coping with a high Australian dollar

3. Trade and market access

- Reduce the impacts of trade-distorting policies
- Improve access to key global markets

4. Not enough people working in agriculture; not enough people with necessary skills; uncompetitive wages

- Attract and retain workers of all skill levels into agricultural careers
- Improve skill levels within agriculture
- Ensure agriculture is competitive with other careers
- Find alternatives to labour

5. Agriculture within society

- Build better community understanding of and trust in agriculture
- Improve credibility, cooperation and goodwill, including with activist groups
- Develop coordinated and proactive approaches to communication

6. Natural resources

- Improve and promote the industry's environmental sustainability
- Improve security of access to natural resources
- Develop appropriate rewards for farmers for environmental stewardship
- Improve preparedness for the impact of climate variability and extreme climatic events
- Manage the risk of domestic diseases and pests

7. Transformational issues

- Ensure that food and fibre industries remain a priority on the national stage
- Sustainably utilise natural resources, including those previously under-developed
- Track issues that are likely to have key future impacts
- Explore and develop alternative labour models
- Explore and develop production technologies for food and fibre

Based on telephone and online surveys, the NFF identified 15 issues that need to be addressed within those themes:

- government policy, funding and decision-making
- commodity prices and the impact of the Australian dollar
- perceptions of agriculture
- climate variability and drought
- fuel and energy costs
- land and input prices
- water availability and management
- carbon markets
- red tape and government regulation
- agriculture sector representation and structure of the wider supply chain.

Department of Agriculture, Fisheries and Forestry 2013, *National Food Plan, Our food future.*

Australia has a strong, safe and stable food system and high levels of food security. Every year Australian farmers and fishers produce enough food to feed around 60 million people—far more food than we consume. Australia exports over half of the food it produces yet over 90 per cent of fresh produce sold here is also produced here.

Most Australians can afford to buy the food they need and can access safe and nutritious food. Our enormous range of growing conditions means that we can produce a huge variety of food and have the wealth to import food when we need or want it. We can always do better, but overall Australia is fortunate when it comes to food.

But the world is changing. In the years ahead Australia's food system will face challenges, such as climate change, population growth, changing economic conditions, competition for resources and diet-related health issues. Along with the challenges there will be unprecedented opportunities for Australia's food industry.

Meeting the challenges and seizing the opportunities will create enormous social, economic and environmental benefits for Australia. To harvest the opportunities of the future we need to focus on four priority areas – competition, safety, research, sustainability.

http://agriculture.gov.au/style%20library/images/daff/_data/assets/pdffile/0011/2293328/national-food-plan-white-paper.pdf

Minister for Agriculture, Fisheries and Forestry, 2012. *Rural Research and Development Policy Statement*

Senator the Hon. Joe Ludwig, Minister for Agriculture, Fisheries and Forestry released a Rural Research and Development (R&D) Policy Statement on 23 July 2012. The Statement was said to pave the way for the future direction of Australian rural R&D. It highlighted the Australian Government's enduring commitment to rural R&D, in partnership with industry.

The Statement is structured around four themes:

- increased transparency and accountability in the Research and Development Corporations Model
- improved coordination and priority setting across the whole rural R&D system.
- an increased range of ways for pursuing productivity growth
- increased operational efficiencies and value for money on research and development investment.

The statement includes the government's final response to the [Productivity Commission's \(PC\) inquiry report on Rural Research and Development Corporations](#) and the Rural Research and Development Council's [National Strategic Rural Research and Development Investment Plan](#).

<http://www.agriculture.gov.au/ag-farm-food/innovation/rural-research-and-development-policy>

Productivity Commission, 2011, *Rural Research and Development Corporations.*

The Productivity Commission was tasked with reviewing the appropriateness of the RDC model and specifically with assessing, inter alia:

- the economic and policy rationale for Commonwealth Government investment in rural R&D;
- the appropriate level of, and balance between public and private investment in rural R&D;
- effectiveness of the current RDC model.

The Productivity Commission concluded that while a modified RDC model should be retained, significant changes to the way in which the Government contributes its funding are appropriate.

The Commission was not convinced that the empirical evidence substantiates the case that Australia's overall spending on rural R&D is much lower than it should be. The report noted that while recent studies which indicate that a slowing in underlying productivity growth in Australia's broadacre rural industries since the mid-1990s can be partly attributed to a decline in public investment in rural R&D, ABS productivity data for agriculture, fisheries and forestry as a whole suggest that trend productivity growth has been much more stable over this period.

The implication is seemingly that productivity outcomes in the broadacre industries over the last decade and a half may not have been representative of what has been happening across the wider rural arena.

The report argued that the basis for public funding for rural R&D should be to induce socially valuable research that would not otherwise have been undertaken (ie to induce additional research). However, the report concluded that the available evidence suggests that the overall degree of research additionality has probably been modest.

The four major conclusions of the report were:

- **Overall public support for rural RD&E:** The overall level of public support for industry-focused research is too high given the sound financial reasons that producers or industries would have to fully fund much of this research themselves. Hence, the report recommended that current cap on dollar for dollar matching of industry contributions by the Government should be halved over a ten-year period
- **Stronger incentives for private sector funding of RD&E:** The basis for the Government's matching contribution to RDCs provides no incentive for producers to increase their investments in the model over time. Hence, the report recommended new, uncapped, subsidy at the rate of 20 cents in the dollar should be immediately introduced for industry contributions above the level that attracts dollar for dollar matching
- **New arrangements for cross sectoral/broad rural R&D:** The report concluded that the present RDCs do not cater well for broader rural R&D needs. Hence, the report recommended that a new, government-funded, RDC - Rural Research Australia (RRA) - should be created to sponsor broader rural research. With RRA in place, the other RDCs should be left to focus predominantly on funding research of direct benefit to their industry constituents.
- **Research governance:** The Report also recommended a range of changes in research governance, including the conduct of independent, robust, performance reviews and monitoring of program outcomes.

<http://www.pc.gov.au/inquiries/completed/rural-research/report/rural-research.pdf>

Rural Research and Development Council (2011), National Strategic Rural Research and Development Investment Plan

The Rural Research and Development Council was appointed by the Minister for Agriculture, Fisheries and Forestry to develop further to develop a vision for the Australia's rural research, development and extension (RD&E). The Council is the Australian Government's key advisory body to provide high-level advice and coordination to target and improve the effectiveness of the government's rural RD&E investment. This report addresses two of the Council's terms of reference:

- developing a National Strategic Rural Research and Development (R&D) Investment Plan
- establish a performance measurement and reporting framework

The plan was developed through, inter alia, extensive consultation, collection of data, commissioned research, stakeholder workshops and responses to a draft report.

The recommendations for change are based, in a context of market opportunity and climate-related challenges, on five key findings:

- Australia's rural RD&E system has an annual turnover of about \$2.9 billion (about 10 % of the national innovation system): \$1.1 billion in 'agricultural, fisheries and forestry' (AFF); \$1 billion in the post farm gate value chain; \$0.8 billion in a 'related to rural' component.
- The rural RD&E system's diversity is a strength - but its complexity and fragmentation make cohesive responses to emerging opportunities and risks challenging.
- Productivity growth is important for economic growth – but it is slowing.
- As RD&E underpins productivity growth and sustainable development any slowdown is of concern.

- The capacity in the rural sector to develop and adopt innovations at the desired rate is compromised by an ageing research workforce and an increasing skills deficit

The Council recommended an increased investment in RD&E, based on a comprehensive set of 'investment goals'. It also recommends that this investment should be shaped by five themes:

1. Industry development

- RDC model an essential element
- National Primary Industries RD&E Framework is central to improving the efficiency and effectiveness
- Scope for greater investment by business in rural RD&E and public-private investments
- Government to invest in conserving genetic diversity

2. Sustainable production

- Government to improve coordination of and collaboration in RD&E (cross-industry) initiatives that inform the management of land, water, marine and other natural resources to achieve sustainable outcomes

3. Transformational RD&E

- Government (often cross portfolio) policies to encourage rural sector to pursue new business opportunities, including in bio-based production.

4. Capacity in people

- Levels of formal education and training in the rural sector relatively low – this risks lack of capacity for innovation;
- Government to invest in initiatives to increase the rural sector's utilisation of technical knowledge, better equipping it for global competitiveness, productivity, adaptability and sustainable development.

5. International links

- Government to build strategic international links and strengthen existing networks to contribute to international efforts to address climate change and sustainably produce food, fibre and renewable energy;
Government to encourage industry and researchers to strengthen links that increase the flow of international capital into Australia's rural RD&E system.

Performance measurement and reporting framework

The Council has commenced the development of a performance measurement and reporting framework for Australia's rural RD&E system. The framework has four components:

- broad measures of rural R&D system achievement
- performance indicators for the five investment themes
- comparison with global rural and other Australian RD&E systems
- indicators of internal risks to which the rural RD&E system can respond.

Department of Agriculture, Forestry and Fisheries, 2002. *National Food Industry Strategy: An Action Agenda for the Australian Food Industry*

The purpose of the action agenda process is to engage stakeholders in the development of the strategy, with industry identifying the actions and tasks that need to be taken to realise its full potential.

The Strategy envisaged that, by 2007, the Australian food industry would be a significant global player with a sustainable and profitable role in the global food product system. It was to commence on 1 July 2002 and included:

- the establishment of a high-level industry council to oversight the development of the industry and the implementation of the Strategy;
- a product and service innovation strategy, which would build on Research and Development (R&D) activities and infrastructure, and establish a Food Innovation Grants (FIG) programme;
- a food trade initiative to develop and implement an international food market entry strategy with a focus on market access, trade development and promotion; and
- a strategy to build more competitive supply chains and improve national food safety and quality systems.

The Strategy is intended to provide the framework for developing and implementing a partnership between the food industry and the Government. It is to deliver their shared vision of increased output, profitability, investment, innovation, export sales and employment in the Australian food industry.

The Government budgeted \$114.4 million to deliver the Strategy over a five year period (1 July 2002 to 30 June 2007). Funds are channelled through the Department of Agriculture, Fisheries and Forestry (DAFF), for industry-led programmes, delivered by National Food Industry Strategy Limited (NFIS Ltd).

The partnership for delivering the Strategy was formalised in a contract between NFIS Ltd and DAFF in October 2002. The Contract was designed to manage the risks associated with the outsourcing arrangements and to achieving the Strategy's outcomes. NFIS Ltd received \$88.5 million to provide Secretariat services to the National Food Industry Council and to deliver the following four key programmes:

- Food Innovation Grants: match dollar for dollar funding for Australian-based food processing firms to undertake R&D projects;
- Food Centres of Excellence: provide grants to Australian food R&D centres to attract and develop world-class capability;
- Food Market Development: undertake collaborative market development projects, between the food industry, State food agencies and the Australian Government, to facilitate an integrated food market strategy; and
- Food Chain: provide funding for food industry demonstration projects, which assist to disseminate chain knowledge and experience to the wider industry, and to support activities aimed at building and strengthening chain management capabilities in the Australian food industry.

<http://trove.nla.gov.au/work/32398720?selectedversion=NBD25700225>

<https://www.anao.gov.au/work/performance-audit/national-food-industry-strategy>

Supermarket to Asia Strategy, 1996

The Supermarket to Asia Strategy was developed jointly by industry and government to meet the challenges of growing Australia's food sales to Asia.

The Supermarket to Asia Council, comprising senior representatives of government and industry, was established by the Prime Minister in September 1996 to provide the leadership and drive necessary to do this. Supermarket to Asia Ltd services the Council by coordinating the various elements of the Strategy and undertaking a work program on its behalf.

The May 1998 Commonwealth Budget provided funding to continue the Supermarket to Asia Strategy for another three years. The role of Supermarket to Asia was expanded to include the new Food and Fibre Chains Program.

Supermarket to Asia undertook a catalyst role aimed at:

- developing a market-led export culture,
- identifying and removing barriers to trade,
- building points of product difference, and
- improving competitiveness through the chain.

The Strategy was replaced by the National Food Industry Strategy on 2002.

<http://www.regional.org.au/au/abts/1999/kennedy.htm>

References

- Leonard, E., Rainbow, R., Trindall, J., Baker, I., Barry, S., Darragh, L., . . . Zhang, A. (2017). *Accelerating precision agriculture to decision agriculture: Enabling digital agriculture in Australia* Retrieved from <http://farminstitute.org.au/LiteratureRetrieve.aspx?ID=160984>
- OECD. (2015). *Innovation, Agricultural Productivity and Sustainability in Australia* Retrieved from <http://dx.doi.org/10.1787/9789264238367-en> doi:<http://dx.doi.org/10.1787/9789264238367-en>

Draft Only