

SECURING
AUSTRALIA'S
FUTURE

Australia's Agricultural Future

7

PROJECT

EXTRACT

Full report available at
www.acola.org.au

AUSTRALIAN ACADEMY
OF THE HUMANITIES

AUSTRALIAN
ACADEMY OF SCIENCE

ACADEMY OF THE SOCIAL
SCIENCES IN AUSTRALIA

AUSTRALIAN ACADEMY
OF TECHNOLOGICAL
SCIENCES AND ENGINEERING

ACOLA



**AUSTRALIAN
COUNCIL OF
LEARNED
ACADEMIES**

SECURING
AUSTRALIA'S
FUTURE

Funded by the Australian Research Council and conducted by the four Learned Academies through the Australian Council of Learned Academies for the Australian Chief Scientist and the Commonwealth Science Council. *Securing Australia's Future* delivers evidence-based research and interdisciplinary findings to support policy development in areas of importance to Australia's future.

EXPERT
WORKING
GROUP

Dr Joanne Daly PSM FTSE (Chair)
Professor Kym Anderson AC FASSA
Professor Rachel Ankeny
Professor Graham Farquhar AO FAA FRS NAS
Professor Bronwyn Harch FTSE
Professor John Rolfe
Professor Richard Waterhouse FAHA FASSA

AUTHORS

Dr Joanne Daly
Professor Kym Anderson
Professor Rachel Ankeny
Professor Bronwyn Harch
Dr Andrew Hastings
Professor John Rolfe
Professor Richard Waterhouse

PROJECT MANAGER

Dr Andrew Hastings

© Australian Council of Learned Academies (ACOLA)

ISBN 978-0-9875798-7-4

This work is copyright. All material published or otherwise created by Australian Council of Learned Academies (ACOLA) is licensed under a Creative Commons Attribution-NonCommercial 4.0 International License.

DATE OF PUBLICATION

July 2015

PUBLISHER

Australian Council of Learned Academies
Level 1, 1 Bowen Crescent
Melbourne Victoria 3004 Australia
Telephone: +61 (0)3 98640923
www.acola.org.au

SUGGESTED CITATION

Daly, J, Anderson, K, Ankeny, R, Harch, B, Hastings, A, Rolfe, J and Waterhouse, R (2015). *Australia's Agricultural Future*. Report for the Australian Council of Learned Academies, www.acola.org.au.

REPORT DESIGN

Lyrebird
joashley@live.com.au

Australia's Agricultural Future

Contents

Project aims	6
Executive summary	8
Key findings	16



Australian Academy of Science



ACADEMY OF THE SOCIAL SCIENCES
IN AUSTRALIA



ACOLA is the interface of the four Learned Academies:

Australian Academy of the Humanities

Australian Academy of Science

Academy of the Social Sciences in Australia

Australian Academy of Technological
Sciences and Engineering

ACOLA



**AUSTRALIAN
COUNCIL OF
LEARNED
ACADEMIES**

Australia's Learned Academies



Australian Academy of the Humanities

The Australian Academy of the Humanities advances knowledge of, and the pursuit of excellence in, the humanities in Australia. Established by Royal Charter in 1969, the Academy is an independent organisation of more than 500 elected scholars who are leaders and experts in the humanities disciplines.

The Academy promotes the contribution of the humanities disciplines for public good and to the national research and innovation system, including their critical role in the interdisciplinary collaboration required to address societal challenges and opportunities.

The Academy supports the next generation of humanities researchers and teachers through its grants programme, and provides authoritative and independent advice to governments, industry, the media and the public on matters concerning the humanities.

www.humanities.org.au



Australian Academy of Science

Australian Academy of Science

The Australian Academy of Science is a private organisation established by Royal Charter in 1954. It comprises ~450 of Australia's leading scientists, elected for outstanding contributions to the life sciences and physical sciences. The Academy recognises and fosters science excellence through awards to established and early career researchers, provides evidence-based advice to assist public policy development, organises scientific conferences, and publishes scientific books and journals. The Academy represents Australian science internationally, through its National Committees for Science, and fosters international scientific relations through exchanges, events and meetings. The Academy promotes public awareness of science and its school education programs support and inspire primary and secondary teachers to bring inquiry-based science into classrooms around Australia.

www.science.org.au

Working Together—ACOLA

The Australian Council of Learned Academies (ACOLA) combines the strengths of the four Australian Learned Academies: Australian Academy of the Humanities, Australian Academy of Science, Academy of Social Sciences in Australia, and Australian Academy of Technological Sciences and Engineering.



ACADEMY OF THE SOCIAL SCIENCES
IN AUSTRALIA

Academy of Social Sciences in Australia

The Academy of the Social Sciences in Australia (ASSA) promotes excellence in the social sciences in Australia and in their contribution to public policy. It coordinates the promotion of research, teaching and advice in the social sciences, promote national and international scholarly cooperation across disciplines and sectors, comment on national needs and priorities in the social sciences and provide advice to government on issues of national importance.

Established in 1971, replacing its parent body the Social Science Research Council of Australia, itself founded in 1942, the academy is an independent, interdisciplinary body of elected Fellows. The Fellows are elected by their peers for their distinguished achievements and exceptional contributions made to the social sciences across 18 disciplines.

It is an autonomous, non-governmental organisation, devoted to the advancement of knowledge and research in the various social sciences.

www.assa.edu.au



Australian Academy of Technological Sciences and Engineering

ATSE advocates for a future in which technological sciences and engineering and innovation contribute significantly to Australia's social, economic and environmental wellbeing. The Academy is empowered in its mission by some 800 Fellows drawn from industry, academia, research institutes and government, who represent the brightest and the best in technological sciences and engineering in Australia. Through engagement by our Fellows, the Academy provides robust, independent and trusted evidence-based advice on technological issues of national importance. We do this via activities including policy submissions, workshops, symposia, conferences parliamentary briefings, international exchanges and visits and the publication of scientific and technical reports. The Academy promotes science, and maths education via programs focusing on enquiry-based learning, teaching quality and career promotion. ATSE fosters national and international collaboration and encourages technology transfer for economic, social and environmental benefit.

www.atse.org.au

By providing a forum that brings together great minds, broad perspectives and knowledge, ACOLA is the nexus for true interdisciplinary cooperation to develop integrated problem solving and cutting edge thinking on key issues for the benefit of Australia.

ACOLA receives Australian Government funding from the Australian Research Council and the Department of Education.

www.acola.org.au



Project aims

Australia's agricultural sector is at a crossroads. Global population growth and increasing affluence in our neighbouring trading partners will present unprecedented opportunities for growth, but agriculture is also facing unprecedented pressures through climate change and climate variability, access to finance, and social and workforce issues.

Australia's Agricultural Future identifies these opportunities and barriers for the agricultural sector in the context of complex social and political issues around rural and regional Australia,

This project aimed to address issues including, but not limited to, the following:

- Identify the factors affecting Australian agriculture's comparative advantage (clean, green, safe, affordable, sustainable and ethical).



- Draw together, examine and articulate the multiple and competing factors impacting the short and long-term sustainability of Australian agriculture.
- Examine Australian agriculture's ability to predict opportunities and challenges and effectively respond and prosper.
- Examine how practices that ensure short-term profitability and producer survival, impact on (and can be reconciled with) the sector's long-term comparative advantage.
- Identify examples by which Australian agriculture can increase productivity without compromising its social licence to operate.



Executive summary

The focus of the report is on emerging issues that may impact on the capability of Australia's agricultural industries to respond to future increases in global demand, particularly in Asia. The report's major conclusions are outlined in Box 1. Overall, Australian agriculture's history of deep resilience, innovation and adaptability encourages optimism.

This report does not attempt to provide a comprehensive view of all opportunities and challenges facing the sector. Instead, it focuses primarily on on-farm issues that: draw on expertise across many areas of activity; challenge our perceptions of agriculture; and require radical thinking and analysis to understand their full impact.

The Federal Government released its Agricultural Competitiveness White Paper, *Stronger Farmers, Stronger Economy*, while this report was in press (Commonwealth of Australia 2015a). As such it was not possible to integrate a review of the white paper into this report's findings. Overall, there is remarkable resonance between the findings and conclusions of this report and the Government's White Paper.



The foundational needs that will stimulate growth in agricultural industries are shared across other industry sectors in Australia

The agricultural sector is often seen as special, and different from other sectors of the economy. This obscures the common threads that will underpin future economic development across the economy: 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.

Agriculture does face unique challenges due to the special status of food, our relationship to the land, and agriculture's importance for the prosperity of rural and regional Australia. Such challenges include the need to sustain Australian agriculture's international reputation for safe and sustainably produced food, and to satisfy consumer concerns about the quality of food and ethical considerations relating to the means of production.

Box 1: Major conclusions for Australia's agricultural future

1. Australia's agricultural sector has a bright future with continuing comparative advantage in the export of bulk commodities and increasing opportunities to respond to the growth in demand for high-value products domestically and in Asia.
2. 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.
3. 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.
4. The sector will need to attract capital and skilled labour in competition with other sectors of the Australian economy.
5. 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.
6. Ongoing investment in research and development, both private and public, is vital to underpin this uptake.
7. 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.

Improvements in agricultural productivity will have flow-on effects on rural and regional communities. It will enhance economic activity in these areas, but may also generate significant social changes in these communities in the coming decades. Automation could see the reduced demand for some labour while at the same time increasing the need for new skills and presenting new career opportunities.

Understanding the heterogeneity in the agricultural sector is essential for securing its future well-being. 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. 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. How Australia reforms institutions and policies affecting the key farm resources of land (including leases that restrict its use), labour (including temporary/seasonal workers from abroad), capital (including foreign investment and ownership), and water will determine the sector's capacity to expand

supplies to meet growing demand abroad. Life-style farms may play a significant role in land management, conservation, alternative energy and tourism, even if they do not contribute extensively to rising agricultural production. Understanding the economic and social drivers across this heterogeneous sector is essential if Government policies are to benefit both the sector itself and associated rural and regional communities.

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

Agriculture continues to be an important export sector in Australia. Agriculture accounts for about 2 per cent of Australia's total GDP (valued at the farm gate) and 15 per cent of the nation's non-services GDP. In 2013–14, the gross value of

agricultural production was worth \$53 billion, with exports of agricultural commodities valued at \$41 billion. While its total contribution to GDP declined throughout the 20th century, agriculture remains an important employer in rural and regional Australia with about 270,000 jobs in 2013–14 (excluding forestry and fishing).

Population growth will drive increased global demand for agricultural products, while growth in the middle class, particularly in Asia, will shift demand profiles. Understanding changing market opportunities will underpin Australia's capacity to respond to these opportunities. By 2050 Australia could see a doubling in the real value of its agricultural exports.

Despite the push to expand earnings by doing more processing prior to exporting, bulk commodities will continue to comprise the majority of Australia's agricultural exports, both in terms of volume and value. An increase in processing capacity in emerging economies will increase demand for bulk commodities and minimally transformed products. This will in turn challenge Australia's food processing sector as trade agreements open up the domestic market to cheap imports.

Australia's food processing industry has an annual turnover of over \$60 billion and added value of \$25 billion (2013–14), and with more than 220,000 workers it is the largest-employing sub-sector in manufacturing. Processors will continue to face strong competition from imported foods, particularly with the estimated 40 per cent of Australian consumers who are trading off price versus convenience. **Australia will be generally unable to compete on price internationally with processed intermediate products.**

'Brand Australia' will continue to be an important component of Australia's comparative advantage in agriculture, driven by consumers and by processors who seek particular attributes such as 'safe, clean and green' food. **Consumers in Australia and overseas will drive opportunities for high-value, branded, specialised products in both domestic and export markets.** The success of the wine industry and the dairy industry

demonstrate that Australia can develop niche markets for high-valued products.

Specialised products will be able to compete well in an expanding domestic market for those consumers who value product attributes, such as safety, sustainable production, high quality and perceived health benefits, over price. Consumer demands will also impact on the uptake of genetically modified food, and concerns about the environmental impact of farming practices will remain important to some. Private regulatory schemes driven by retailers are set to become increasingly influential in the food value chain.

Australia's market share and brand reputation will always be under threat of erosion by competitors as they seek to match our reputation for quality and safety. Understanding market dynamics and what the market is prepared to pay for are critical to maintaining or expanding our market share.

Governments will continue to play a role in creating market access for both imports and exports. While global demand for food is certainly increasing, government facilitation of market opportunities in both Australian and overseas markets will have a dominant role in how this translates to business opportunities.

There are opportunities to increase the supply of Australian agricultural products to meet increased demand

The ending of the mining investment boom will benefit agriculture. A return to historical exchange rates of the Australian dollar and less competition for rural labour by mining firms, coupled with rising demand for food exports, will provide more favourable growth conditions for Australian agriculture in the next ten years. Australian agriculture has a long history of innovation, resilience and adaptability and high levels of productivity growth compared with other Australian industry sectors. While productivity growth in agriculture remains higher

than many other industries, it is low compared to the growth seen in the 1950s to the 1990s. Improvements in productivity growth through increasing technology inputs and technical efficiency are necessary to increase production and profitability.

Most improvements in farm output will come from existing farms, both from increases in agricultural productivity and from capital deepening. Existing farming enterprises will move to more profitable commodities and will increase the productivity of traditional commodities. This will require ongoing adoption and adaptation of existing and new technologies, improvements in breeding made possible through advanced genomics, and ongoing improvements to management practices. Investments in infrastructure and capital improvements will be required to capture the benefits of new technologies and to exploit more sophisticated supply chains.

Farm production can also be expanded through intensification in some regions. Recent work on water access and availability indicates the potential for Tasmania and northern Australia to expand irrigation cropping and to convert some pastoral land to cropping. Capturing these opportunities will require addressing environmental, land tenure, infrastructure and capital constraints as well as conducting rigorous assessment of the costs and benefits.

Improving agricultural productivity growth is not without challenge. **Most empirical work suggests that Australian farmers are operating close to the limits of technical efficiency.** Having grown at an average of 2.4 per cent per annum between 1953 and 1994 total factor productivity has since become more varied with little overall growth from 1994 to 2013, in part due to the effect of the 'Millennium Drought' and other adverse climate conditions. There is also evidence that the stagnation in the intensity of public investment in agricultural R&D since the late 1970s has contributed to this slowdown. In the future, incrementally closing the gap between

potential and actual yields may be less important than new technological changes arising from ongoing fundamental research.

Transformational changes in technology and practices, advances in genetics and moves towards knowledge-driven systems are some of the keys to advancing productivity growth.

A higher level of R&D investment is needed in these areas into the future to build on excellent returns on past investments. Public investment in agricultural research and development appears to have stagnated or been in decline in recent decades, although recent changes in the way that these data are published has made it difficult to accurately assess this. Australia's highly regarded rural research and development corporation model, introduced in the late 1980s, has slowed this decline and led to significant interactions between researchers and industry. Both fundamental and applied research is needed to provide the essential pipeline of innovations that have characterised Australian agriculture throughout the last two centuries.

The agricultural sector depends on a healthy resource base to continue increasing productivity

Broadacre agriculture depends on healthy soil, water, and biodiversity. Australia has moved to a more inclusive approach to managing its rural landscapes in areas such as landcare, catchment management, and reductions in land clearance. Continuing to engage people in these activities will not only benefit agriculture but will also support healthy rural communities.

Agricultural industries' access to water markets has resulted in a more efficient use of this resource. It has also stimulated a more opportunistic use of irrigation for crops such as rice and cotton. **Future water markets will need to include all possible non-agricultural uses of water in rural landscapes.** This includes

competing sectors such as the unconventional gas industry that requires groundwater for extraction.

Climate change and climate variability present significant long-term risks to agriculture that need to be managed.

As the driest inhabited continent, Australia is particularly vulnerable to climate change where it results in changes to rainfall patterns. While there is still some uncertainty about the regional impacts of climate change, it is already clear that southern Australia's rainfall is decreasing, particularly in the autumn when winter crops are germinating, which threatens Australia's international competitiveness in dryland farming. Climate variability has always been a feature of the agricultural production environment so there is an ongoing need to manage risks associated with fluctuations in production, and hence farm incomes, arising from periods of prolonged drought. R&D will be needed to provide transformational changes in productivity in the face of climate change.

Managing the interface between agriculture and community issues will be critical for the well-being of rural and regional Australia

Although the bush has held a special place in the traditional Australian identity, **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—just half of what it was in 2000. Technological changes, increased automation and shifts in commodity demands have all contributed to this.

Nevertheless, labour shortages remain a problem in rural areas. Harvesting in particular is increasingly reliant on foreign labour, whether guest workers or 'back-packers'. The profitability of farming and agribusinesses will depend increasingly on its ability to attract highly skilled labour and investment, in competition with other sectors.

Australians need to challenge community perceptions of agriculture as a 'sunset industry'.

This view does not match the resilience shown by the sector in its adjustment to economic reforms of the 1980s, in contrast to traditional manufacturing which declined as operations moved off-shore. Many agri-business entities remain profitable. In recent decades Australia has seen major expansion in wine, oilseeds and livestock exports.

Governments need to develop policies that address the diverse needs of the heterogeneous agricultural sector. Social problems faced by many in rural communities, particularly small, unprofitable farms, are not always those that stimulate economic growth in production, and the reverse is also true. The profitable parts of the rural sector also have a role—urban populations, particularly young people, need to be sold the message that modern agriculture provides significant business and employment opportunities drawing on contemporary skills.

Part of the pessimistic view of agriculture is based on the notion of 'aging farmers'. **In common with other developed countries, the median age of Australian farmers is increasing at a faster rate than general aging of the population.** However, this should not be an impediment to future growth of agriculture. Australia still has the second highest proportion of farmers under 35 years of age, 14 per cent, compared with twenty-nine other developed countries. This trend has four underlying causes: a fall in the number of farms which has reduced opportunities for new entrants; a decline in the number of people under 25 in the general population coupled with longer periods in

education; a delay in retirement of 'baby boomers'; and an increasing age of marriage leading to fewer women entering farming through this pathway.

The view that the family farm is the preferred model of farm ownership should also be challenged. If the goal is to expand agricultural production to meet increasing global demand, it may not matter who owns the farm, but rather whether the farm has access to the capital and skills needed to grow and adapt the business.

Australian citizens and governments value the notion of the family-owned farm, which still accounts for 95 per cent of farms and 77 per cent of farmland. However, small family farm businesses are less able to access and adopt advanced technologies and may lack access to enough capital to underpin adaptation to changes in both the environment and market demands, and to manage income variability associated with the risks of agricultural production such as exchange rate movements or drought. Mergers of family farms have been occurring over recent decades leading to a reduction in the number of medium-sized farms. However, a range of different farm business models continues to provide diversity and flexibility.

Community groups have concerns about the extent of foreign ownership and foreign labour in farming, concerns that are much less evident in other sectors in Australia where foreign ownership is common and foreign investment is the norm. **The future of the agricultural sector could be constrained by ongoing community concerns about foreign investment and foreign labour.** Without more foreign investment in farms and agribusinesses, domestic capital providers including local superannuation funds may need to be encouraged to reduce their reticence to invest in potentially risky farming enterprises.

Accelerating the uptake of advanced technologies and communications is 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.**

Farmers will use real-time information to tailor farm management of inputs to maximise yield and quality of outputs. Automation will continue to grow and robots will harvest and prune, 'drones' will survey fences in pastoral leases and check for problems in high-valued crops. Tractors are already 'computers on wheels.' Access to skilled labour not traditionally regarded as 'agricultural' will be critical—**farmers will need access to mechatronic engineers and ICT experts to run machinery.** This will place agriculture in competition with other sectors of the economy for these skills. 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.

These databases will need to be regionally and locally relevant. Australia is a world leader in creating national databases on water access and availability, on soil maps, and on biodiversity. These databases are overcoming barriers to interoperability among data collected by different

agencies—this means that data from different sources can be combined in a meaningful way. National databases on water availability have enabled water markets to operate based on real-time data. Governments will need to continue to invest in maintenance and development of these national databases. Investment in R&D, education and training will also be essential to realise the potential of this information flow, while enabling the agricultural sector to make the most of its limited resources in a more sustainable way.

Farmer-driven innovation has always been a feature of Australian agriculture. **Partnerships between farmers, researchers, communities and others in the value chain will foster innovation.**

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. Some of the most successful agricultural groups already foster the formation and maintenance of these networks. Regular meetings between researchers and farmers, where knowledge and experience flow both ways, ensure a greater appreciation of current problems and possible solutions.

Agriculture does face unique challenges due to the special status of food, our relationship to the land, and agriculture's importance for the prosperity of rural and regional Australia.



Key findings

Demand for Australian agricultural products

1. **Demand for agricultural products in Australia is expected to grow in line with both an increasing domestic population and international demand.** The latter will be driven by global population growth and increased affluence, particularly from Asia.
2. **Bulk commodities will continue to comprise the majority of Australia's agricultural exports, both in terms of volume and value.** Australia is a major exporter of wheat, beef, cotton, wool, oilseeds, wine, lamb, sugar, barley, milk products, and horticultural products. This is driven both by our comparative advantage in these commodities and by the trustworthiness of our product in terms of perceptions of its quality and safety. Strong export performance is expected to continue, boosting that part relative to other parts of the sector.



3. **There are opportunities for Australia in high-valued branded, specialised products, but to exploit this niche segment of the market profitably will require state-of-the-art information systems and marketing strategies.** Australian producers and processors will need a sophisticated understanding of international markets, including the nuances of consumer preferences, and will need to form strategic partnerships with foreign marketing agencies, distributors and consumers.
4. **Increased global demand for food will also bring increased global competition in our markets.** Our comparative advantage could be eroded in the future as other countries also seek to respond to the most lucrative consumer demands, and as they improve their food safety and certification systems.

5. **Australia's reputation for 'clean and green' products will continue to be important.**

This will be true both for bulk commodities and processed products for domestic and international markets. Our claims must be supported by evidence and accreditation, and be more compelling than those of competitors. It is also crucial to develop a better understanding of domestic and international consumers' views on 'clean and green' attributes, including food safety, nutrition, environmental impacts or other factors, and what premiums they are willing to pay for products that meet particular standards.

6. **The domestic market will remain important for Australian produce even though food imports will continue to grow.** An ability to retain our share of the domestic market over imports will depend strongly on understanding how different consumers trade off price, convenience and perceived attributes to do with food safety, quality, variety, seasonality and presentation style.

7. **Globally, governments will continue to define opportunities and market access for Australian exports.** Policy interventions affecting food self-sufficiency, mandates on biofuels, stimulus to domestic processing industries, and market access rules—including for sanitary and phytosanitary quarantine measures—will all have significant effects. An ongoing public policy challenge is to ensure that demand growth is proportionate to population and income drivers through government actions to enhance access to markets and limit the growth in (and ideally reduce) agricultural protectionism. Governments will also need to be alert to the impact of global private regulation, such as GlobalGAP, and the potential trade restrictions arising from the quality demands of large transnational retail chains that sometimes are even stricter than international trade law disciplines.

8. **Our domestic market will continue to be influenced by global drivers, such as commodity prices, consumer preferences, seasonality, and changes to regulatory, trade and information systems.** Connectivity, adaptability and supply responsiveness among agricultural industries will be critical to success.

Potential for Australian agriculture to meet increased demand

1. **Prospects for increasing Australia's supply of agricultural produce to meet growing demands are positive, but with important caveats.** There are some opportunities to use land and water resources more efficiently in existing and new agricultural regions, through intensification of production supported by appropriate planning, research, capital investment, adoption of new technologies as soon as they appear, and better management and adoption of new practices.
2. **Securing the soil resource on-farm will underpin future productivity growth.** A holistic framework that enables farmers to make the best use of technology, data resources, knowledge and expertise to manage and secure their soil resource will underpin the future productivity growth and success of Australia's agricultural sector. This will require collaboration and coordination across the sector, including linking research, government planning, and information systems with farmers on the ground.
3. **Opportunities exist to expand and intensify agricultural production in northern Australia and Tasmania so long as underlying constraints and environmental impacts are addressed.** Any proposal should consider all major

impacts and be subject to rigorous appraisal, particularly in northern Australia where there may be a lack of necessary infrastructure. Developments may also require permission to change land use from grazing to cropping on pastoral leases—taking into account implications for native title.

- 4. Future increases in total factor productivity will require significant new investments in research and development from both the public and private sectors.** Greater investment in basic and applied research, and greater capital availability, including human capital, are needed to overcome low farm profitability and prospective climate change impacts. Applied research outcomes need to be disseminated, demonstrated, and commercialised appropriately to increase the speed of uptake. Further increases in public expenditure will stimulate private investment in R&D.
- 5. Continuing development of water markets is a vital part of Australia's agricultural future.** Regulatory and land-use planning reforms need to address water conflict issues between agricultural and gas production, and between agricultural and environmental needs to ensure this issue does not become a significant constraint to agriculture's future. Capacity to manage adjustment to water supply and demand through intra- and inter-state leasing and selling of water rights will be critical to success in this area.
- 6. While agriculture and food production can be a driver of negative impacts on biodiversity, they can also play a very important role in conservation, for both private and public good.** Improved soil and land management by farmers needs to be part of Australia's agricultural future. This will require the right market signals and policy instruments.

- 7. Increasing productivity growth and deepening capital investment are the key public policy challenges for increasing the supply of agricultural outputs in Australia.** Key mechanisms to improving productivity include increasing research outputs, increasing profitability and capital access, increasing availability of information and communication technologies, and improving the ability of managers to adopt and trial better techniques and to process and analyse market information. Investment policies will be required to ensure that agricultural industries can compete effectively for finance with other sectors.

Australian agriculture's social and political context

- 1. There are an increasing number of social and economic stressors in the agricultural sector in Australia.** Increased productivity but relative declines in profitability have led to major declines in rural workforces, and an ongoing reduction in the number of enterprises, with knock-on effects on rural communities—particularly smaller communities.
- 2. Australians' connections to the land are declining although cultural values relating to the inherent value of farming continue to be held across the community.** Direct links between a mainly urbanised population and rural Australia are declining at the same time that concerns about a range of issues associated with agricultural practices, including environmental sustainability, animal welfare, and food safety, are increasing.
- 3. Access to services will continue to be problematic for rural and regional communities.** Difficulty in locally accessing quality healthcare, mental health services, education and other services is contributing to social stressors in rural communities.

4. **Solutions to problems facing rural communities will need to be grounded in a local context.** Many important issues need to be solved locally or regionally, so they require local community-level solutions that are targeted as precisely as possible so as to maximise their social benefit/cost ratio. One size does not fit all in terms of both opportunities for and threats to those rural communities.
5. **Trends towards concentration, intensification and vertical co-ordination may reduce the role of small family farms and increase foreign ownership.** Despite the need for new sources of investment in agriculture, this trend is generating community concerns.
6. **Land tenure and planning need to allow farming to evolve.** Tourism, biodiversity conservation, urban development, forestry and mining all compete for rural land. Governments need to work with communities to ensure that shifts in land use are beneficial while not being hampered by unnecessary or excessive regulations.
7. **Alternative models of farm financing, such as contingent loans, need to be developed to meet the needs for farm businesses faced with fluctuating incomes and reduced capacity to borrow.** Family farms are not only sites of production but also the family home, resulting in farmers tending to be risk averse towards debt. Better ways to encourage productive uses of capital and different investment models may improve access to finance while enabling older farmers to capitalise on their assets.
8. **Australia needs to address the erosion of its 'social licence to operate' in the agricultural and food sectors.** Scandals (animal welfare, food safety, labelling), romanticised views of agriculture that are incompatible with modern technologies, and perceptions of agriculture as damaging to the environment all contribute to that erosion.
9. **Genetically modified crops and foods represent both opportunities and risks for the Australian food industry.** This will largely depend on the perceived benefits and risks of particular categories of products. The industry has a role to play in how genetically modified food products are ultimately viewed by consumers. Retailer-led private regulatory structures will impact on the adoption of this technology, and retailers' marketing and voluntary labelling practices will impact on its public acceptance.
10. **Key public policy challenges include managing the ongoing restructuring pressures in the agricultural sector and the flow-through impacts to rural and regional Australia.** These include managing the major risks that agriculture is likely to face and developing the appropriate institutional frameworks, human capital resources and policy settings that will allow agricultural producers and their communities to be innovative and resilient including in their management of risks.
11. **There is a need for a shared, positive vision and narrative for agriculture in Australia.** This must be constructed through dialogue and consultation with various stakeholders, including the general public, and should not rely on an over-romanticised idea of farming. The place of agriculture in contemporary society needs clarifying via articulation of shared societal values regarding issues critical to agriculture's future including technology, health, rural and regional development, and education.

Farms of the future— transformative technology

- 1. 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. While employment may drop in traditional farming activities, it will grow in these agribusiness service industries.
- 2. The food value chain is increasingly utilising modern information systems.** This means that production from the most-informed sellers can better match consumer needs and demands of supermarkets and other buyers. Provenance information will be critical to providing the evidence for Australia's reputation as "clean and green". Agri-intelligence is a crucial national infrastructure asset that can provide Australia the knowledge-based information that markets demand. Data along the food value chain will see the creation of "data markets"—with a focus on timely delivery and analysis of relevant information. To best exploit these emerging trends, information collection needs to be both nationally consistent and locally relevant.
- 3. Technological requirements of future farming may drive farmers to specialise in production whereas risk-reduction and sustainability drivers could push some farms to be more diverse.** Future farming will need to trade-off the need for knowledge intensity versus the opportunistic response to changes in weather, in markets, and consumer choices.
- 4. Agriculture and food industries will need access to reliable, real-time information about markets, consumer preferences, and the conditions of the resource base.** Comparative advantage will rely on responsiveness to shifts in market and consumer trends both internationally and domestically, as well as on the productivity of the resource base.
- 5. Profitable agricultural industries will support those farmers and their communities that are innovative and well connected.** Connections support vibrant rural and regional communities and provide an attractive environment for new entrants into farming. They also help to shift public perceptions of agriculture away from the misguided view that it is a sunset industry.
- 6. 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.
- 7. Agricultural production and marketing are increasingly knowledge-intensive activities, drawing on technological developments in computing, engineering and data analysis.** Robotic machinery and sensor networks will require fast internet connections and a skilled workforce to support them. Australian producers need to continue to upgrade their skill and knowledge base if they are not to lose markets to more-sophisticated and/or lower-wage suppliers abroad. Farmers and agribusiness can take better advantage of new technologies to improve connectedness, and knowledge exchange, such as via social media.

About Securing Australia's Future

In June 2012 the Australian Government announced *Securing Australia's Future*, a \$10 million investment funded by the Australian Research Council in a series of strategic research projects. Projects are delivered to the Commonwealth Science Council by the Australian Council of Learned Academies (ACOLA) via the Office of the Chief Scientist and the Australian Chief Scientist.

Securing Australia's Future is a response to global and national changes and the opportunities and challenges of an economy in transition. Productivity and economic growth will result from: an increased understanding in how to best stimulate and support creativity, innovation and adaptability; an education system that values the pursuit of knowledge across all domains, including science, technology, engineering and mathematics; and an increased willingness to support change through effective risk management.

Six initial research topics were identified:

- i. Australia's comparative advantage
- ii. STEM: Country comparisons
- iii. Smart engagement with Asia: Leveraging language, research and culture
- iv. The role of science, research and technology in lifting Australian productivity
- v. New technologies and their role in our security, cultural, democratic, social and economic systems
- vi. Engineering energy: unconventional gas production

Two further research topics have been identified:

- vii. Australia's agricultural future
- viii. Sustainable urban mobility

The Program Steering Committee responsible for the overall quality of the program, including selection of the Expert Working Groups and the peer review process, is comprised of three Fellows from each of the four Learned Academies:

Professor Michael Barber FAA FTSE
(Chair)

Mr Dennis Trewin AO FASSA
(Deputy Chair—Research)

Professor James Angus AO FAA

Dr John Burgess FTSE

Professor Bruce Chapman AO FASSA

Professor Ruth Fincher FASSA

Professor Paul Greenfield AO FTSE

Professor Lesley Head FAHA

Professor Peter McPhee AM FAHA FASSA

Professor Stephen Powles FAA FTSE

Dr Susan Pond AM FTSE

Professor Graeme Turner FAHA

www.acola.org.au



ACADEMY OF THE SOCIAL SCIENCES
IN AUSTRALIA



ACOLA



**AUSTRALIAN
COUNCIL OF
LEARNED
ACADEMIES**

7

PROJECT

