



Australian Government

Grains Research and  
Development Corporation

# GRDC ANNUAL REPORT

2014-2015

# Highlights of 2014–15

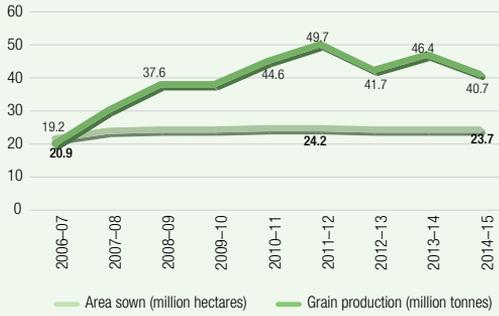
- The GRDC and Bayer CropScience announced the Herbicide Innovation Partnership, a major international collaboration to develop innovative solutions to the challenges of weed management.
- The GRDC and the Victorian Government partnered to establish a managed environment facility for field research into the productivity and profitability of wheat and canola in high-rainfall regions.
- The Australian Pastures Genebank was established, providing a national repository for seed and data, and a hub for genetic resource activities, for pasture and forage plants.
- The Yield Gap Australia website was launched, providing an interactive map and the latest data to assist growers and the wider industry to identify and achieve water-limited potential yields.
- Three apps for mobile devices were launched, to assist growers to manage crop diseases, assess the yield potential of crops and access National Variety Trials data.
- The Australian Export Grains Innovation Centre introduced crop-specific business development managers with specialist expertise in wheat, barley, oats and canola.
- New tools for digital image analysis gave the Pulse Breeding Australia field pea and lentil breeding programs a full season's advantage over the traditional seed-sampling methods.
- Comprehensive, evidence-based guidance was provided to canola growers to help limit future infections of beet western yellows virus.
- A major new investment, the National Frost Initiative, commenced work on genetic and agronomic approaches to minimising frost effects, and tools for forecasting and mapping frost events.

## Operating environment in 2015–16

The main factors expected to influence the GRDC's operating environment in 2015–16 are:

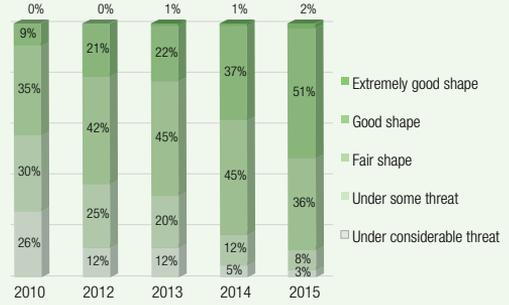
- new arrangements and governance requirements under the *Primary Industries Research and Development Act 1989* and the *Public Governance, Performance and Accountability Act 2013*, including a funding agreement between the GRDC and the Australian Government
- implementation of the *Grains Industry National Research, Development and Extension Strategy*
- implementation of the Australian Government's Science and Research Priorities and corresponding Practical Research Challenges
- pressure on productivity growth rates
- changes to wheat export marketing arrangements, and recommendations of the Wheat Industry Advisory Taskforce
- significant changes within the global grain market, including an increase in overseas demand for Australian grain and global food security issues
- the increased need to form and leverage private sector collaborations to deliver innovation to the Australian grains industry
- volatility in grain prices and market requirements, grain production, and exchange rates
- reduced farm profitability, which may limit growers' financial capacity to adopt the results of RD&E
- climate variability, affecting on-farm decisions and requiring an increase in innovative tools to forecast and manage risks.

**Figure 1: Total grain production and cropping area, 2006–07 to 2014–15**



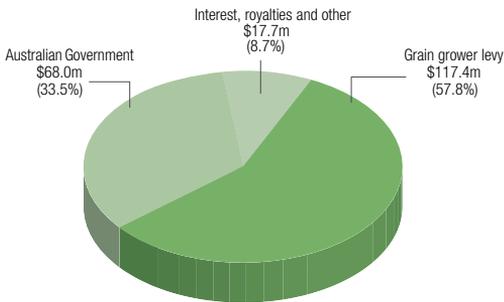
Source: Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) *Australian Crop Report* and *Agricultural Commodities* (formerly *Australian Commodities*) reports

**Figure 2: Grower mood towards the state of the Australian grains industry**



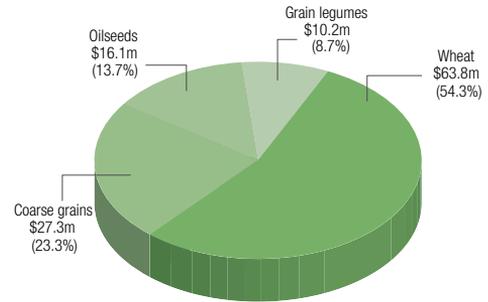
Source: GRDC Grower Survey

**Figure 3: Income in 2014–15**



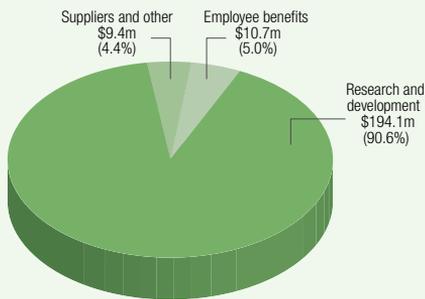
Source: GRDC Financial Statements 2014–15

**Figure 4: Grain grower levy by crop type in 2014–15**



Source: GRDC Financial Statements 2014–15

**Figure 5: Expenditure in 2014–15**



Source: GRDC Financial Statements 2014–15

**Figure 6: RD&E investments by theme in 2014–15**



Source: GRDC Financial Statements 2014–15

**Table 1: Five years at a glance**

	2014–15		2013–14	2012–13	2011–12	2010–11
<b>GRDC</b>						
Revenue	\$203.1m	▼	\$209.1m	\$196.4m	\$177.5m	\$175.5m
Expenditure	\$216.0m	▲	\$184.4m	\$178.0m	\$165.1m	\$154.1m
Operating surplus/(deficit)	(\$12.8m)	▼	\$24.7m	\$18.4m	\$12.3m	\$20.8m
Total assets	\$278.4m	▲	\$267.7m	\$265.3m	\$230.7m	\$206.0m
Total equity	\$191.3m	▼	\$203.8m	\$180.6m	\$162.2m	\$149.3m
Industry contributions	\$117.5m	▼	\$120.2m	\$118.2m	\$97.7m	\$104.5m
Commonwealth contributions	\$68.0m	▼	\$68.6m	\$62.8m	\$55.9m	\$53.4m
R&D expenditure	\$194.1m	▲	\$165.4m	\$159.2m	\$150.2m	\$140.7m
Employee benefits	\$10.7m	▲	\$9.6m	\$8.2m	\$7.2m	\$6.9m
Suppliers	\$9.4m	▲	\$8.7m	\$7.3m	\$6.7m	\$5.7m
Number of full-time GRDC staff <sup>a</sup>	59	▲	56	48	46	48
Number of projects <sup>b</sup>	942	▲	939	920	896	868
<b>Grains industry</b>						
Estimated number of grain farms <sup>c</sup>	25,350	▲	19,101	19,101	20,960	21,144
Number of grain crops covered by R&D levies	25	–	25	25	25	25
Estimated gross value of production	\$13,135m <sup>d</sup>	▼	\$15,413m	\$13,622m	\$12,237m	\$11,964m
Total grain production—summer and winter crops ('000 tonnes) <sup>e</sup>	40,700	▼	46,361	41,700	49,687	44,629

a Number of full-time GRDC staff at 30 June.

b Projects that received funding during the financial year. Figures for 2010–11 to 2012–13 restate the numbers of projects shown in previous GRDC annual reports to focus on projects that received funding during the financial year.

c Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) estimates. The figure for 2014–15 is the number of broadacre farms planting at least 40 hectares for grain, oilseed or pulse production. Figures for 2010–11 to 2013–14 are the numbers of broadacre farms plantings of at least 100 hectares for grain, oilseed or pulse production. Figures for 2010–11 restate the estimated numbers of grain farms shown in previous GRDC annual reports following ABARES advice that previous estimates had included non-grain crops.

d Latest ABARES forecast for the gross value of production of grains and oilseeds, excluding rice—from the June 2015 *Agricultural Commodities* report.

e Latest ABARES estimates for total summer and winter crop production, excluding cotton seed and rice—from the June 2015 *Australian Crop Report and the June 2015 Agricultural Commodities* report.



# Letter of transmittal

**GRDC**  
**Grains  
Research &  
Development  
Corporation**



**Australian Government**  
**Grains Research and  
Development Corporation**

15 October 2015

The Hon. Barnaby Joyce MP  
Minister for Agriculture and Water Resources  
Parliament House  
CANBERRA ACT 2600

Dear Minister

I have pleasure in presenting the annual report of the Grains Research and Development Corporation (GRDC) for the year ended 30 June 2015, in accordance with section 28 of the *Primary Industries Research and Development Act 1989* (PIRD Act), and section 46 of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

The GRDC is confident that its performance in 2014–15 contributed to the industry's and the government's vision for a profitable, internationally competitive and ecologically sustainable Australian grains industry. This achievement is consistent with the GRDC's responsibility to plan, execute and report against the:

- objects of the PIRD Act as they apply to the GRDC
- planned outcomes of the corporation's Strategic R&D Plan 2012–17
- goals and performance measures described in the annual operational plan
- outcome and deliverables described in the portfolio budget statements.

This annual report complies with the planning and reporting requirements for 2014–15 as prescribed by the PGPA Act and the Public Governance, Performance and Accountability (Financial Reporting) Rule 2015 (FRR).

The attached report of operations was made in accordance with a resolution of the corporation's directors on 23 September 2015 and presents fairly the information required by the FRR.

Yours sincerely

Richard Clark  
Chair

Level 4  
4 National Circuit  
Barton ACT 2600  
PO BOX 5367  
KINGSTON ACT 2604  
T +61 2 6166 4500  
F +61 2 6166 4599  
grdc@grdc.com.au  
www.grdc.com.au

*Your GRDC working with you*



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# PART 1— OVERVIEW

Photo: Arthur Mostead

About the GRDC

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Report from the Chair and the Managing Director

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# About the GRDC

## Purpose

The Grains Research and Development Corporation (GRDC) exists to drive the discovery, development and delivery of world-class innovation to enhance the productivity, profitability and sustainability of Australian grain growers and benefit the grains industry and the wider community.

The GRDC invests in research, development and extension (RD&E) and related activities across a portfolio spanning temperate and tropical cereals, coarse grains, pulses and oilseeds. This involves coordinating and funding activities; monitoring, evaluating and reporting on their impact; and facilitating the dissemination, adoption and commercialisation of their results.

The GRDC does not undertake R&D itself. Rather, it partners with other organisations that have the necessary capabilities to undertake the specialised work.

The GRDC also contributes to the development of strategic national approaches to grains industry RD&E, to reduce fragmentation and duplication, and to help address industry-wide issues such as biosecurity and climate variability.

While its focus is on delivering benefits to its primary stakeholders, Australian grain growers, the GRDC also generates outcomes from investing in RD&E that benefit other participants in the Australian grains industry value chain, the research community and the wider Australian community.

The GRDC is a corporate Commonwealth entity within the Australian Government's Agriculture portfolio. The GRDC delivers one outcome that supports the overarching portfolio outcomes:

*New information and products that enhance the productivity, competitiveness and environmental sustainability of Australian grain growers and benefit the industry and wider community, through planning, managing and implementing investments in grains research and development.*

## Stakeholders

The GRDC's key stakeholders are Australian grain growers and the Australian Government. Through them, the GRDC delivers outcomes to benefit grains industry participants across the value chain, the wider agricultural sector, the research sector, and the broader Australian community.

The grains industry operates across the Australian landscape and makes a major economic contribution at the national, state and regional levels. In 2014–15, the GRDC described the grains industry in terms of the three geographical regions shown in Figure 7.



John Harvey, GRDC Managing Director, addresses the inaugural GRDC Grower R&D Forum, held in Canberra in March 2015. Photo: Geoff Comfort



**Figure 7: Grain-growing regions at 30 June 2015**

### NORTHERN REGION

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The **Northern Region** encompasses Queensland's cropping zones and northern New South Wales. The region has generally high inherent soil fertility, although there is increasing evidence that this has been run down over time. It has relatively high seasonal rainfall and production variability compared to the other two regions.

Both summer and winter crops are important for profit. Yield significantly depends on conservation of soil moisture from summer-dominant rainfall.

This region has the greatest diversity of crops, including maize, sorghum and soybeans as well as wheat, barley, winter-growing pulses and oilseeds.

The Northern Region is the largest source of Australia's premium hard high-protein wheat for export and domestic use. Demand for feed grains from the region's livestock industries is a key driver of grain production.



### SOUTHERN REGION

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The **Southern Region** encompasses south-eastern Australia, including central and southern New South Wales, south-eastern South Australia, Victoria and Tasmania.

It has diverse soils with generally low fertility and many subsoil constraints, such as salinity, sodicity and toxic levels of some elements, although there are also some areas with very productive soils.

Yield potential depends on seasonal rainfall, especially during the growing season, and there is less dependence on stored soil moisture than in the Northern Region.

Crop production systems are varied and include many mixed farming enterprises with significant livestock and cropping activities.



### WESTERN REGION

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The **Western Region** spans Western Australia's principal cropping zones, where soil fertility is generally low and yields depend on winter and spring rainfall.

Long-term variability in seasonal rainfall and production is lower than in the Northern and Southern regions.

In many areas, yields are low by world standards; this is compensated for by the large scale and degree of mechanisation of the enterprises.

Wheat, barley, canola and lupins are the dominant crops, and livestock enterprises in mixed farming systems are generally of less importance than in the other regions. The Western Region exports more than 85% of its grain production.



## Relationships

The GRDC works closely with Australian grain growers and the Australian Government to ensure that their RD&E priorities are effectively addressed through GRDC investments.

Grower interests are represented through:

- the GRDC's national and regional advisory panels
- the reporting relationships between the GRDC and Grain Producers Australia
- the proactive participation of grower groups in RD&E
- grower directors on the GRDC's skills-based Board
- Grower Solutions Groups (Northern Region) and Regional Cropping Solutions networks (Southern and Western regions), which bring together industry people at a local level to provide on-the-ground insights into priority issues requiring R&D attention
- GRDC-supported delivery and communication channels, such as grower and farming systems groups; grower and adviser updates; industry development awards; national, regional and local industry events; and technical workshops on specific issues.

Under the National Primary Industries Research, Development and Extension Framework, the GRDC is actively involved in the Grains Industry National Research, Development and Extension Strategy Implementation Committee, together with representatives from each of the state departments of agriculture, CSIRO, universities, industry and the Australian Government. The committee works to:

- harness the necessary capability (people, infrastructure and information) for present and future RD&E needs
- provide shared strategic directions and priorities planning
- overcome capability gaps, create critical mass and reduce fragmentation and unnecessary duplication of effort across the nation.

The GRDC holds regular discussions with its portfolio department, the Department of Agriculture.

Understanding the importance of RD&E expertise and communication capability in achieving its outcomes, the GRDC also maintains strong

connections with its other stakeholders, particularly research partners. These include state departments, CSIRO, universities, cooperative research centres, other rural R&D corporations, and investment partners from the private sector. Links with agribusiness, including farm advisers and agronomists, are growing.

Effective partnerships enable the GRDC to leverage resources and research capability; share market knowledge, technologies and intellectual property; and reduce the risk associated with individual, sole-funder investments. The GRDC collaborates with other rural R&D corporations and other organisations with an interest in the grains value chain and enterprises that are interdependent with grain growing, to increase the return on its investment and deliver greater benefits to the Australian grain grower.

The GRDC also builds strong relationships with organisations overseas, both to broaden the resources available to the Australian grains industry and to access international RD&E efforts that offer potential benefits, such as food security, for the wider Australian community.

## Legislation

The GRDC was established in 1990, under the then *Primary Industries and Energy Research and Development Act 1989*. As a result of amendments made in December 2013, that Act is now known as the *Primary Industries Research and Development Act 1989* (PIRD Act).

The PIRD Act provides for the funding and administration of primary industries R&D to:

- increase the economic, environmental and social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of the products of primary industries
- achieve sustainable use and management of natural resources
- make more effective use of the resources and skills of the community in general and the scientific community in particular
- support the development of scientific and technical capacity
- develop the adoptive capacity of primary producers
- improve accountability for expenditure on R&D activities in relation to primary industries.



As a corporate Commonwealth entity, the GRDC is subject to the requirements of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act).

## Funding

The GRDC is principally funded by a grower levy and Australian Government contributions.

The levy is based on the net farm gate value of the annual production of 25 crops: wheat; coarse grains—barley, oats, sorghum, maize, triticale, millets/panicums, cereal rye and canary seed; pulses—lupins, field peas, chickpeas, faba beans, vetch, peanuts, mungbeans, navy beans, pigeon peas, soybeans, cowpeas and lentils; and oilseeds—canola, sunflower, safflower and linseed. Farm gate value of production differs from the gross value of production, as farm gate value deducts costs of storage, handling, freight and ‘free on board’ costs.

The Australian Government matches the levy up to a limit of 0.5 percent of the three-year rolling average of the gross value of production of the 25 leviable crops.

## Planning and reporting

The GRDC has performance reporting obligations set out in legislation, as well as a strong commitment to being accountable to grain growers, the Australian Government and the broader community.

Detailed information on the GRDC’s accountability is provided in Part 3. The following sections describe the core elements of the annual cycle of reporting on performance against planned objectives.

Table 2 outlines the elements of the GRDC’s planning and reporting framework.

**Table 2: Elements of the planning and reporting framework**

Element	Purpose
Annual operational plan <sup>a</sup>	Specifies the annual budget, resources and research priorities that give effect to the strategic R&D plan during a given financial year.
Annual procurement plan	Makes procurement information publicly available through the Australian Government’s AusTender procurement management website.
Annual report <sup>a</sup>	Provides information on research, development and extension (RD&E) activities and their performance in relation to the goals set in the annual operational plan and portfolio budget statements for a given financial year.
Funding agreement <sup>a</sup>	Sets out the terms and conditions under which money paid to the GRDC by the Commonwealth will be spent for four financial years.
Growers’ report <sup>a</sup>	Provides performance information to growers on RD&E activities for a given financial year.
Investment plan	Informs potential research partners about some of the GRDC’s new investment priorities for the next financial year and invites interested parties to submit research proposals.
Portfolio budget statements <sup>a</sup>	As part of the Australian Government budget process, summarise the planned outcomes, deliverables, performance information and financial statements for a given financial year.
Stakeholder report <sup>a</sup>	Provides information that assists Grain Producers Australia to determine whether it needs to discuss the GRDC levy rate with the Minister.
Strategic R&D plan <sup>a</sup>	Sets out the GRDC’s high-level goals, strategies and performance measures for a five-year period, developed in consultation with stakeholders and approved by the Minister.

<sup>a</sup> Available at [www.grdc.com.au/About-Us/Corporate-Governance](http://www.grdc.com.au/About-Us/Corporate-Governance).

## Strategic R&D plan

In line with section 19 of the PIRD Act, the GRDC Board communicates its strategic directions and performance objectives through a five-year strategic R&D plan.

The GRDC’s strategic R&D plan for the five financial years to 2016–17 took effect from July 2012. It is designed to achieve a balanced portfolio of short-, medium- and long-term objectives, and describes the strategies that will be applied to achieve those objectives and the performance indicators that will be used to measure success.



The Strategic R&D Plan 2012–17 provides a framework for investment based on six themes that emerged from the RD&E priorities of Australian grain growers and the Australian Government.

From the point of view of grain growers and the wider industry, the plan takes into account the RD&E priorities set out in the *Grains Industry National Research, Development and Extension Strategy*, as well as the key RD&E priorities that were identified in the consultation process for the plan's development, as detailed in Table 3.

**Table 3: Grains industry priorities for research, development and extension**

Priority	Objectives
Meeting market requirements.	Understanding market opportunities for Australian grain. Crop and variety selection aligned with market requirements. Crop production aligned with market requirements. Grain harvest and storage practices aligned with market requirements.
Improving crop yield.	Genetic yield potential and stability improvement of: <ul style="list-style-type: none"> <li>• cereal varieties</li> <li>• pulse varieties</li> <li>• oilseed varieties.</li> </ul>
Protecting your crop.	Effective, sustainable and efficient management of: <ul style="list-style-type: none"> <li>• weeds</li> <li>• vertebrate and invertebrate pests</li> <li>• cereal rusts</li> <li>• cereal (non-rust), pulse and oilseed fungal pathogens</li> <li>• nematodes</li> <li>• viruses and bacteria.</li> </ul> Biosecurity and pesticide stewardship.
Advancing profitable farming systems.	Knowing what is important (key business drivers). Planning strategically (building system benefits and rotations). Responding tactically (individual crop agronomy).
Improving your farm resource base.	Understanding and adapting to climate variability. Improving soil health. Managing water use on dryland and irrigated grain farms. Understanding and valuing biodiversity. Communication of sustainable production methods.
Building skills and capacity.	Grains industry leadership and communication. Capacity building in the extension sector and the R&D sector. Capacity building for growers.

The plan also incorporates the Australian Government's key objectives for RD&E, as expressed in the National Research Priorities (2002), the Rural R&D Priorities (2007) and the National Innovation Priorities (2009). Since the plan was finalised, the National Research Priorities have been superseded by the Strategic Research Priorities (2013) and the Science and Research Priorities (2015).

More details of the government priorities are provided in Appendix A, which reports on expenditure in each priority area.

Figure 8, an outline of the GRDC's performance framework under the strategic R&D plan, demonstrates how the GRDC's investment themes, objectives and corporate strategies flow from the grains industry and government priorities.



**Figure 8: Performance framework**

Government and industry objectives	Australian Government priorities			Industry priorities		
	Primary Industries Research and Development Act 1989	Strategic Research Priorities*	Rural R&D Priorities	Grains Industry National Research, Development and Extension Strategy	Industry priorities	
<p>Increased economic, environmental and social benefits to members of primary industries and to the community in general by improving the production, processing, storage, transport or marketing of grain.</p> <p>Sustainable use and management of natural resources.</p> <p>More effective use of the resources and skills of the community in general and the scientific community in particular.</p> <p>Development of scientific and technical capacity.</p> <p>Development of the adoptive capacity of grain growers.</p> <p>Improved accountability for expenditure on R&amp;D activities.</p>	<p>Living in a changing environment.</p> <p>Promoting population health and wellbeing.</p> <p>Managing our food and water assets.</p> <p>Securing Australia's place in a changing world.</p> <p>Lifting productivity and economic growth.</p>	<p>Productivity and adding value.</p> <p>Supply chain and markets.</p> <p>Natural resource management.</p> <p>Climate variability and climate change.</p> <p>Biosecurity.</p> <p>Supporting the Rural R&amp;D Priorities:</p> <ul style="list-style-type: none"> <li>Innovation skills</li> <li>Technology.</li> </ul>	<p>Improved processes to build on existing national collaboration.</p> <p>Effective relationship models for private-public coexistence.</p> <p>National research programs, national centres of research capacity and regional networks of applied RD&amp;E under the 'major-support-link' framework.</p> <p>National capability planning for human and physical infrastructure.</p> <p>Better and ongoing alignment of stakeholder priorities and RD&amp;E resource allocation.</p>	<p>Meeting market requirements.</p> <p>Improving crop yield.</p> <p>Protecting your crop.</p> <p>Advancing profitable farming systems.</p> <p>Improving your farm resource base.</p> <p>Building skills and capacity.</p>		
GRDC RD&E investment themes	<b>1 Meeting market requirements</b>	<b>2 Improving crop yield</b>	<b>3 Protecting your crop</b>	<b>4 Advancing profitable farming systems</b>	<b>5 Improving your farm resource base</b>	<b>6 Building skills and capacity</b>
Intermediate outcomes (5 years)	<ul style="list-style-type: none"> <li>Understanding market opportunities for Australian grain.</li> <li>Crop and variety selection aligned with market requirements.</li> <li>Crop production aligned with market requirements.</li> <li>Grain harvest and storage practices aligned with market requirements.</li> </ul>	<ul style="list-style-type: none"> <li>Genetic yield potential and stability improvement of cereal varieties.</li> <li>Genetic yield potential and stability improvement of pulse varieties.</li> <li>Genetic yield potential and stability improvement of oilseed varieties.</li> </ul>	<ul style="list-style-type: none"> <li>Effective, sustainable and efficient management of weeds.</li> <li>Effective, sustainable and efficient management of vertebrate and invertebrate pests.</li> <li>Effective, sustainable and efficient management of cereal rusts.</li> <li>Effective, sustainable and efficient management of cereal (non-rust), pulse and oilseed fungal pathogens.</li> <li>Effective, sustainable and efficient management of nematodes.</li> <li>Effective, sustainable and efficient management of viruses and bacteria.</li> <li>Biosecurity and pesticide stewardship.</li> </ul>	<ul style="list-style-type: none"> <li>Knowing what is important (key business drivers).</li> <li>Responding strategically (building system benefits and rotations).</li> <li>Responding tactically (individual crop agronomy).</li> </ul>	<ul style="list-style-type: none"> <li>Understanding and adapting to climate variability.</li> <li>Improving soil health.</li> <li>Managing water use on dryland and irrigated grain farms.</li> <li>Understanding and valuing biodiversity.</li> <li>Communication of sustainable production methods.</li> </ul>	<ul style="list-style-type: none"> <li>Grains industry leadership and communication.</li> <li>Capacity building in the extension sector.</li> <li>Capacity building in the R&amp;D sector.</li> <li>Capacity building for grain growers.</li> </ul>
Aspirational outcomes (10+ years)	Australian grain growers maintain and increase access to current and future grain markets by aligning on-farm production practices with quality and functionality requirements.	Cereal, pulse and oilseed varieties with significant, sustained and stable improvements in water-limited yield potential over current elite varieties in key agroecological zones and across a range of seasons.	Australian grain growers managing their farms to maximise profit and reduce risk by adopting effective, sustainable and efficient control of weeds, pests and diseases.	Australian grain growers managing farming systems that are able to respond and adapt to changing environmental and market conditions to reduce risk and deliver an increase in profitability.	Grain growers are valued for adopting practices that improve regional habitat, soil, water and atmosphere resources in a changing climate.	A dynamic Australian grains industry with the skills and capacity to continuously innovate.
GRDC corporate strategies	Create value	Coordinate nationally	Deliver regionally	Connect globally	Engage with growers and industry	
GRDC Outcome	Australian grain growers utilising new information and products that enhance the productivity, profitability and sustainability of growers and benefit the grains industry and wider community.					
GRDC Vision	A profitable and sustainable Australian grains industry, valued by the wider community.					

In May 2015, the government announced the Science and Research Priorities, which will replace the Strategic Research Priorities in the GRDC's planning and reporting framework from 2016-17.



## Annual operational plan

Each year's activities are outlined in an annual operational plan, as required by section 25 of the PIRD Act.

The annual operational plan describes the activities that the GRDC will undertake to implement the goals of the strategic R&D plan in the financial year ahead. It includes an outcome-based performance measurement framework that is consistent with the outcome, objective, deliverables and performance indicators set out in the portfolio budget statements.

The annual operational plan is shaped by the investment themes and objectives of the strategic R&D plan and informed by feedback on the results of previous GRDC investments and the changing RD&E needs of the Australian grains industry. Feedback is obtained through:

- engagement with growers, advisers and other industry participants
- consultation through the GRDC's regional panels and representative bodies such as Grain Producers Australia, farmers' organisations, Regional Cropping Solutions networks and similar structures, grower groups, and agribusiness reference groups
- analysis of program reviews, project progress reports and survey results.

The GRDC applies this knowledge through its annual process of investment planning and review to ensure that the RD&E activities it supports will deliver outcomes that meet the needs of the industry and the Australian Government.

## Annual report

At the end of the financial year, the GRDC publishes an annual report that addresses legislated performance reporting requirements. In 2014–15, the key requirements were set out in:

- sections 28 and 33 of the PIRD Act
- section 46 of the PGPA Act, the Public Governance, Performance and Accountability (Consequential and Transitional Provisions) Rule 2014, and the Public Governance, Performance and Accountability (Financial Reporting) Rule 2015
- Schedule 2, Part 4, of the *Work Health and Safety Act 2011*
- section 516A of the *Environment Protection and Biodiversity Conservation Act 1999*
- Part II of the *Freedom of Information Act 1982*.

The annual report also meets the GRDC's responsibilities for reporting against the Australian Government portfolio budget statements. In addition to the audited financial statements, it includes assessments of performance against operational and corporate performance indicators.

This Annual Report 2014–15 details the GRDC's achievements against the performance framework set out in the Annual Operational Plan 2014–15 and the Strategic R&D Plan 2012–17.

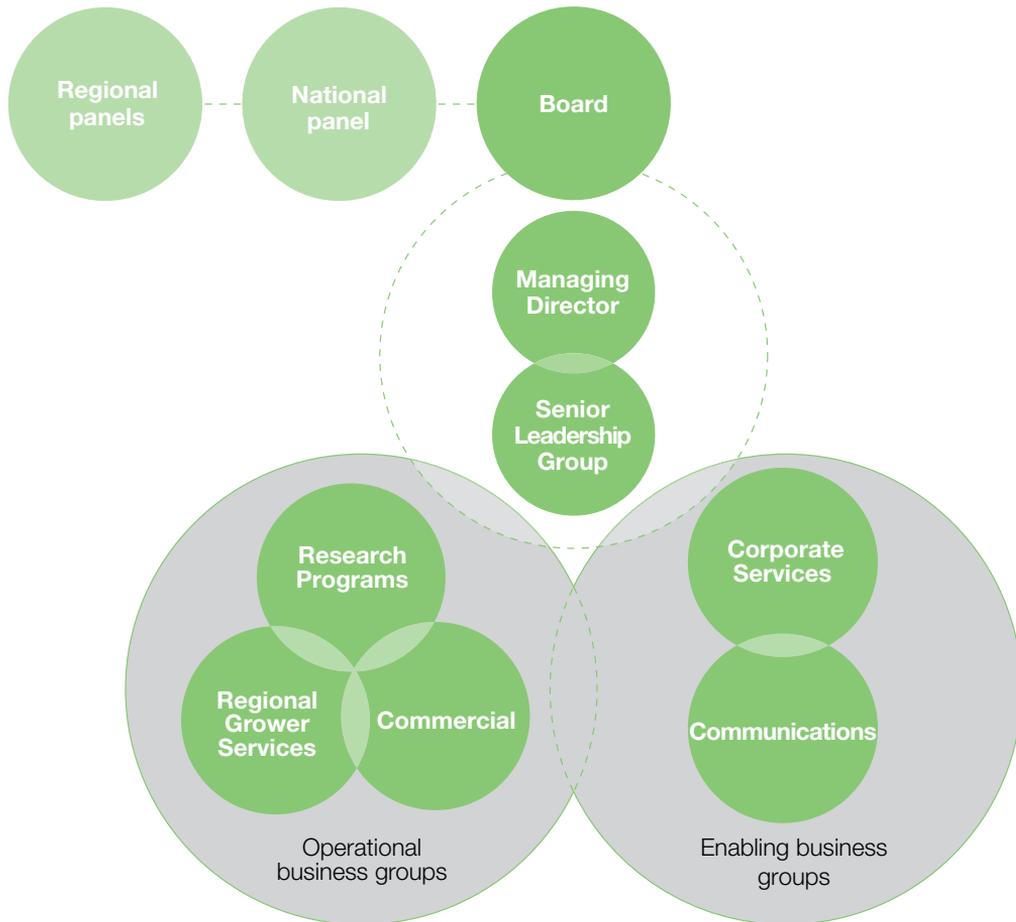
## Structure

The GRDC's organisational structure is designed to most effectively apply the organisation's resources to achieve its operational and strategic outcomes.

Figure 9 shows the GRDC's organisational structure at 30 June 2015. More details on the composition, responsibilities and activities of the Board, advisory panels, Senior Leadership Group and business groups are provided in Part 3.



**Figure 9: Structure at 30 June 2015**



## Location

Most GRDC staff are located in offices at the following Canberra address:

Grains Research and Development Corporation  
Level 4 East Building, 4 National Circuit  
BARTON ACT 2600

The GRDC also has a dedicated manager of grower services based in each of the three grain-growing regions.



# Report from the Chair and the Managing Director

Australia's grain growers are renowned for their expertise and resilience in managing their farm systems. Our grain growers are also respected for embracing innovation in order to improve productivity and profitability, collectively strengthening the industry's competitiveness.

The GRDC works in partnership with growers, advisers, researchers and other industry stakeholders to maintain the sustainability and profitability of the Australian grains industry. As in any industry, we have to challenge ourselves to remain competitive, to ensure that we not only survive but prosper. A healthy, profitable and world-leading grains industry is not just in the best interests of growers, it is in the best interests of all Australians.

## Grains industry production

In 2014–15, total winter crop production in Australia declined by 8 percent to 38.4 million tonnes as a result of drier seasonal conditions across the country. Winter crop production in Victoria declined by 19 percent to 5.5 million tonnes, the lowest level since 2009–10, while in Western Australia production fell by 12 percent relative to the large 2013–14 crop. Queensland and New South Wales also experienced declines in winter crop production of between 6 percent and 7 percent.

The area planted to summer grain, oilseed and pulse crops (excluding rice and cottonseed) decreased by around 9 percent in 2014–15. Although seasonal conditions improved in summer cropping regions in New South Wales and Queensland in December 2014 and January 2015, total summer grain, oilseed and pulse production (excluding rice and cottonseed) decreased by 4 percent to 3.8 million tonnes in 2014–15. Grain sorghum production increased by 39 percent to 1.8 million tonnes as a result of an increase in the area planted in Queensland and higher average yield.

The following production figures were recorded for the major winter crops:

- wheat production declined by around 7 percent to 23.7 million tonnes

- barley production declined by around 13 percent to 8.0 million tonnes
- canola production declined by around 11 percent to 3.4 million tonnes.

## GRDC performance

In 2014–15, the GRDC invested more than \$194 million in 942 RD&E projects ranging from small short-term, solution-orientated projects to long-term strategic initiatives that will deliver step-change breakthroughs to complex problems, such as herbicide resistance and frost.

This annual report provides specific information on the key performance indicators that keep the GRDC's annual operations and expenditure in line with the targets of its Strategic R&D Plan 2012–17, the Agriculture portfolio budget objectives and industry and government priorities. We continue to achieve good results across all these measures.

Through the GRDC's comprehensive investment portfolio, we are continually breaking new ground for the benefit of growers—and our investments deliver results. On average, every \$1 investment returns \$5 in benefits to the industry. The value of these benefits is intensified during challenging conditions, such as the market volatility and decline in production experienced by growers in the past 12 months.

The GRDC Grower Survey, which has enabled grain growers to help shape our strategic focus and positioning since 1993, is another key measure of our performance. The GRDC met all performance targets measured in the 2015 survey. This year 83 percent of growers said that they have directly benefited from RD&E undertaken in the grains industry over the past five years. This proportion is a significant 10 points greater than in 2014 and is the highest since 2004.

There was an increase in the proportion of growers who view our performance as an investor in grains research positively. There were also significant increases in the proportion of growers saying that they directly benefit from RD&E and that the GRDC has played a role in that benefit.



Overall, growers' comfort with paying the GRDC levy is the most widespread it has been since 2010, at 79 percent, which is a strong signal that our strategic direction is aligned with the priorities of Australian growers.

## Grower engagement

Growers' needs determine the GRDC's strategic investments in RD&E. We gain insight into the challenges faced by growers through our regional advisory panels. These panels are supported by Regional Cropping Solutions networks (RCSNs) and other communication channels, enabling growers around the country to help shape our investment decisions.

These networks have enhanced the GRDC's understanding of locally specific challenges faced by growers and helped the GRDC to shape timely responses to address the issues. In addition to the 33 members of its Northern, Southern and Western regional advisory panels, the GRDC now has more than 108 RCSN members, who engaged a further 193 growers in Western Australia in a recent open session meeting. A further 805 growers and advisers were engaged directly on local issues through Grower Solutions Groups in the Northern Region.

This engagement has allowed the GRDC to bring together a broad network of growers, advisers and grains industry representatives to help inform the GRDC as it makes investments in grains RD&E, and to more rapidly address local issues of concern and deliver results that can be adopted straightaway by farmers in their own paddocks.

Since the establishment of the RCSNs, the GRDC's footprint of engagement with the grains industry has become the largest it has ever been, giving the GRDC much greater insight into the issues directly affecting growers. Better understanding of these issues enables the GRDC to make the right investments to provide growers with the knowledge, tools or technology they need for on-farm practice change.

During 2014–15, GRDC staff, panel members and update coordinators also met with some 4,747 growers and advisers through the GRDC's program of one-day and two-day updates on local issues. We also met 805 growers and advisers through open meetings in the Northern Region, and consulted 677 growers and advisers through field day events such as Dowerin, Newdegate, Mingenew and AgQuip.

We are also strengthening our online presence. Our social media channels attract a significant following, which is increasing. We currently engage with 4,897 Twitter followers, 3,768 Facebook likes, 976 LinkedIn followers and 509 YouTube subscribers.

## GRDC partnerships

Collaboration creates a multiplier effect, giving our industry the resources to tackle a deeper and broader range of R&D priorities. The GRDC works with local, national and international partners to provide more solutions for growers.

Through partnership, the grains industry is better futureproofed and better equipped to respond to any forces which may undermine its profitability and productivity.

This year we forged a major collaboration with Bayer CropScience, signing a five-year, \$45 million agreement to establish the Herbicide Innovation Partnership, to accelerate the discovery and development of innovative weed management solutions. The major aim is to provide new technologies to manage weeds, which cost Australian growers in excess of \$3 billion per year. The cooperation also includes a postdoctoral research program and training in advanced industrial research techniques which will expand scientific know-how among Australian researchers.



Adrian Percy, Bayer CropScience Head of Research and Development, and Richard Clark, GRDC Chair, at the signing of the Herbicide Innovation Partnership agreement.  
Photo: Jez Rozdarz



## The year ahead

The GRDC has a very proud history of success, spanning nearly 25 years. Varieties and farming practices that the GRDC helped to deliver have transformed the industry, maintaining and building the profitability and sustainability of Australian grains enterprises.

During those years, the industry has evolved and grown, and a complex array of changes in the industry has begun to impact on our effectiveness. For example:

- The industry has grown significantly, from \$8.5 billion in 2009–10 to \$13.1 billion in 2014–15.
- State government departments and other traditional research partners are reducing their role in RD&E due to declining budgets.
- The private sector is playing an increasingly important role in grains innovations.
- Grains research is becoming increasingly global.
- There are evolving industry and government issues and agendas that need to be carefully considered.
- The GRDC is growing in significance and influence, and is expected to play a greater leadership role in the national and global grains sectors.

It is time for us to reposition the GRDC for the future. We understand that the GRDC must continue to adapt if we are to meet the changing needs of those we serve: Australian grain growers and the wider Australian community.

To do this, the GRDC has embarked on a comprehensive program to better equip itself to succeed in an increasingly complex environment. This means transforming our systems, our processes, our structure and our culture. This focus on improvement will see 95 percent of our expenditure going directly into RD&E and commercialisation, while less than 5 percent will be spent on indirect overheads and administration.

The GRDC has completed a significant review of its systems and processes, with the aim of improving the experiences of growers and research partners as they engage with us. We are striving to make it easier for growers to see what we are doing for them, and how that translates to on-farm productivity and profitability.

We are strengthening our regional engagement and regional delivery by growing our already substantial rural footprint, by moving many GRDC functions closer to growers. The Board has decided to establish four regional offices, each led by a general manager charged with developing and implementing a regional strategy for short-term and medium-term investments. The new model will recognise the great diversity in environmental factors, farming systems and grower profiles across the nation and deliver better coordination and tailored benefits to growers at the regional and local levels.

As well as achieving a significant transfer of focus and function to the regions, we will maintain a central office in Canberra, to continue our focus on longer term, strategic research investments which are best managed centrally. This will support strong international interactions and collaboration with other Australian organisations, such as government bodies, research institutions and industry representatives.

The Board acknowledges that this renewal is both necessary and challenging. We are endeavouring to achieve it with minimal disruption to our core business.

We believe these changes will ultimately make the GRDC more responsive to the needs of grain grower communities across the nation, and advance the global competitiveness of Australian grain growers by delivering to them world-leading innovation.



**Richard Clark**  
Chair



**John Harvey**  
Managing Director



# PART 2—OUR PERFORMANCE



Photo: Arthur Mosted

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# Corporate performance

The GRDC's performance is measured against the corporate strategies and performance indicators established in the GRDC's five-year strategic R&D plan, annual operational plan and portfolio budget statements.

This section describes the GRDC's corporate performance in 2014–15, in terms of:

- examples of effective implementation of the corporate strategies
- analysis of feedback obtained from grain growers
- results of impact assessments of R&D project groups

- Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES) findings on farm financial performance and total factor productivity in the grains industry.

## Corporate strategies

The GRDC's strategic approach to RD&E investment is underpinned by five corporate strategies set out in the Strategic R&D Plan 2012–17 and the Agriculture Portfolio Budget Statements 2014–15.

Table 4 provides examples of the GRDC's performance against the corporate strategies and their objectives in 2014–15.

**Table 4: Corporate performance overview**

Indicator	Performance
<b>Strategy: Create value.</b>	
Deliver value by investing in programs that address the key industry priorities with the greatest potential returns.	<p>Under the Strategic R&amp;D Plan 2012–17, the GRDC's research, development and extension (RD&amp;E) investment portfolio is based on six themes identified as key grains industry value drivers. The focus on outcomes for each theme, rather than R&amp;D disciplines and inputs, has improved the GRDC's responsiveness to grower needs.</p> <p>In 2014–15, the benefits of this approach included:</p> <ul style="list-style-type: none"> <li>• investment in a \$16 million, five-year, national initiative to address the adverse impact of frost across the cropping regions of Australia—this initiative will deliver a combination of genetic and management solutions to growers</li> <li>• continued investment in technologies that accelerate the incorporation of economically beneficial traits in varieties released to growers—the use of molecular markers as surrogates in selecting lines is now routine, with some breeding companies deploying more than 50 markers linked to important traits in their variety development programs.</li> </ul>
<b>Strategy: Coordinate nationally.</b>	
Ensure that programs are nationally coordinated and the Australian grains industry has access to the RD&E infrastructure and capability that it needs for the future.	<p>The GRDC uses its position as the major investor in grains RD&amp;E in Australia to coordinate investment to reduce duplication and fragmentation.</p> <p>The GRDC is actively implementing the <i>Grains Industry National Research, Development and Extension Strategy</i>, which aims to improve the efficiency and effectiveness of RD&amp;E capability by strengthening coordination between the Australian Government, state governments, research institutions and industry. The GRDC is active in cross-sectoral strategy development and implementation and leads the soils strategy.</p> <p>Particular achievements in providing a national approach in 2014–15 included:</p> <ul style="list-style-type: none"> <li>• successful implementation of digital image analysis in the national Pulse Breeding Australia field pea and lentil breeding programs—this enabled breeders to make selections for quality traits prior to sowing, providing a full season's advantage over the traditional seed-sieving methods</li> <li>• establishment of the Australian Pastures Genebank, an unincorporated joint venture for investment in the genetic improvement and adoption of pasture plants across Australia, with support from five rural R&amp;D corporations, including the GRDC—this investment will deliver returns to growers through increased crop yields and whole-farm productivity</li> <li>• investment with the Victorian Government in the establishment of a high-rainfall managed environment facility at Hamilton—this new infrastructure will support field research to improve the productivity and profitability of wheat and canola in southern and western high-rainfall grains regions.</li> </ul>



**Table 4: Corporate performance overview** (continued)

Indicator	Performance
<b>Strategy: Deliver regionally.</b>	
<p>Deliver the outputs of research in innovative products and services relevant to growers and their advisers in each region.</p>	<p>The GRDC has improved the timeliness, relevance and packaging of research results for delivery to growers, as demonstrated by a significant increase in the proportion of respondents to the Grower Survey who feel that they have directly benefited from RD&amp;E, from 73% in 2014 to 83% in 2015.</p> <p>Addressing growers' need for the latest research-backed guidance on cropping, the GrowNotes series was expanded to include a further nine crops for the Northern Region, two crops for the Western Region and one crop for the Southern Region.</p> <p>GRDC Farm Business Updates were delivered to growers and advisers in the Southern and Western regions, while farm business management issues were addressed in Grains Research Updates in the Northern Region. The <i>Farming the Business</i> manual was launched in March 2015 and quickly taken up by thousands of growers.</p> <p>Media coverage of GRDC activities and research outputs increased by 42% in 2014–15, an outstanding result given a general decline in numbers of media outlets and grains reporters in rural and regional Australia. The <i>Ground Cover</i> newspaper remained the premier source of RD&amp;E information across the grains industry, with around 43,000 subscribers.</p> <p>Public access to project information was significantly improved through the GRDC website during 2014–15. This included publishing project summaries for 2014 projects online; progressing online, standardised access to final reports and field trial reports; and activating a new online knowledge library with advanced search features and access to information associated with around 6,000 projects and 7,920 articles.</p>
<b>Strategy: Connect globally.</b>	
<p>Proactively source new technologies and innovation from around the world for the Australian grains industry.</p>	<p>The GRDC sources technology, expertise and genetic material from outside Australia, directly and through its R&amp;D and commercialisation partners.</p> <p>The GRDC launched a major new collaboration, the Herbicide Innovation Partnership, with Bayer CropScience. The partnership will accelerate the development of new tools and innovative technology to assist grain growers to sustainably manage weeds. It will also create opportunities for Australian researchers to work with international peers at a world-class research centre in Germany.</p> <p>The GRDC maintained its longstanding relationships with the International Center for Agricultural Research in the Dry Areas, the International Crops Research Institute for the Semi-Arid Tropics and the International Maize and Wheat Improvement Center. Through these collaborations, breeding materials with potential to improve frost tolerance and resistance to rust, crown rot and root-lesion nematodes in cereal crops were identified and delivered to Australian breeding programs.</p> <p>Developed by the GRDC in collaboration with the eXtension Foundation in the United States, eXtensionAUS successfully connected virtual communities of grains subject experts with growers and advisers in an interactive online environment.</p> <p>Cooperation with overseas institutions contributed to many GRDC-supported projects. Examples included developing wheat varieties with resistance to the Ug99 strain of stem rust; assessing key competitor varieties in international wheat markets; and designing an acoustic system for monitoring biohazards in grain storage systems.</p> <p>Through scholarships and travel awards, the GRDC supported individual Australian grain growers and scientists to travel overseas and deepen their knowledge of advances in research, technology and farming techniques.</p>



**Table 4: Corporate performance overview** *(continued)*

Indicator	Performance
<b>Strategy: Engage with growers and industry.</b>	
Actively listen to and engage with growers and the broader grains industry.	<p>Through its regional advisory panels, Regional Cropping Solutions networks in the Southern and Western regions and Grower Solutions Groups in the Northern region, the GRDC listens to and engages with growers and their advisers to identify and understand issues that require RD&amp;E investment.</p> <p>The GRDC released annual reports for all three regions in 2014–15. As well as summarising priority issues and desired outcomes, the reports included details of GRDC investment responses to identified industry issues and relevant, existing GRDC projects.</p> <p>In March 2015, the GRDC supported 60 grains industry leaders to attend the inaugural GRDC Grower R&amp;D Forum in Canberra. The forum enabled delegates to discuss a range of strategic issues and directly inform the GRDC about longer term industry needs.</p> <p>The GRDC hosted another forum that was the first of its kind, in July 2014, focusing on nitrogen management in the Southern Region. The forum brought together interested industry representatives and research providers to appraise past and current RD&amp;E investments and identify a range of gaps in knowledge, capacity and adoption. The outputs helped to inform the GRDC's 2016–17 investment cycle.</p> <p>The regional panel members undertook a wide range of activities to keep in contact with growers and advisers in 2014–15, including:</p> <ul style="list-style-type: none"> <li>• attending field days, workshops, and conferences</li> <li>• participating in Regional Cropping Solutions networks</li> <li>• taking spring tours to engage face to face with growers, grower groups and researchers, and learn about local industry issues and research gaps first hand.</li> </ul> <p>The GRDC participated in the 2014 Australian Grains Industry Conference, and engaged with grower groups and grower representative groups, including Grain Producers Australia.</p>



The GRDC welcomed a delegation from the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) in August 2014. (From left) William Dar, then ICRISAT Director-General, John Harvey, GRDC Managing Director, and Joanna Kane-Potaka, ICRISAT Director Strategic Marketing and Communication. Photo: GRDC

## Grower Survey

The GRDC Grower Survey helps the GRDC to assess and improve its performance, particularly in terms of ensuring that research outcomes are being communicated effectively to growers. Results of the Grower Survey are used in the performance overviews for the investment themes in the annual report.

A total of 1,200 growers are invited to take part in the survey, including growers from each agroecological zone. The participation rate increased to 63 percent in 2015, from 45 percent in 2014.

The survey results in Table 5 present the GRDC's track record of achievement against selected key performance indicators since 2012.



**Table 5: Performance against selected Grower Survey key performance indicators, 2012 to 2015, by proportion of growers surveyed (%)**

Key performance indicator	2012	2013	2014	2015
Growers rating GRDC performance very or fairly high	75	79	79	83
Growers directly benefiting from grains R&D activities generally in the past five years	76	76	73	83
Growers directly benefiting from GRDC activities or initiatives	67	63	62	71
Growers feeling that new grain varieties met expectations	60	68	70	76
Growers aware of regional panels	68	68	67	72
Growers having direct contact with regional panel members	27	28	26	29
Growers rating the value of regional panels as very or fairly high (among growers who had direct contact with panels)	74	77	76	78

## Impact assessments

The GRDC undertook impact assessment studies of four groups of projects in 2014–15, in accordance with the *Impact Assessment Guidelines* released in May 2014 by the Council of Rural Research and Development Corporations. The studies were undertaken through an independent consultant.

The key financial results of this analysis are highlighted in Table 6.

The four groups of projects were also assessed on the economic, environmental and social benefits arising from GRDC investments, although not all benefits were quantified for formal analysis. The findings are summarised in Table 7.

**Table 6: Financial results of analysis of project groups, 2014–15**

Project group	Present value of benefits \$m	Present value of costs \$m	Benefit:cost ratio	Net present value \$m	Internal rate of return %
Australian Peanut Genetic Improvement Program	21.9	14.8	1.5	7.1	7.5
Prospective Heat Initiative	195.8	45.5	4.3	150.4	14.6
Mungbean Breeding Program	137.1	12.2	11.2	124.9	14.6
Prospective Water Productivity Initiative	222.1	84.4	2.6	137.7	12.0

Notes: Present value of benefits = the discounted value of benefits

Present value of costs = the discounted value of investment costs

Benefit:cost ratio = the ratio of the present value of investment benefits to the present value of investment costs

Net present value = the present value of benefits less the present value of costs

Internal rate of return = the discount rate at which an investment has a net present value of zero (that is, where the present value of benefits is equal to the present value of costs)

Analysis is calculated from benefits and costs 25 years after the final investment utilising a discount rate of 5% per annum to reflect the long timeframe between R&D activities and adoption. Both the heat and water use programs were assessed on the basis of forecasts rather than results to date.



**Table 7: Economic, environmental and social benefits identified by impact assessments**

Economic benefits	Environmental and social benefits
<b>Australian Peanut Genetic Improvement Program</b>	
<ul style="list-style-type: none"> <li>• Increased profitability of peanuts via increased yields, improved quality, and reduced use and cost of chemicals.</li> <li>• Increase in capital value of peanut germplasm in the program between 2008 and the end of the investment in 2015.</li> <li>• Potential seed royalties from export of peanut germplasm.</li> <li>• Potential for increased area of peanuts grown in sugarcane rotations, leading to yield and disease break benefits in the following cane crops.</li> <li>• Potential intellectual property exchange or cash returns in the future should any seed of released varieties from the program be exchanged or marketed overseas, particularly for ultra-early varieties.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced use of agrochemicals to control nematodes and other soil pathogens in cane crops, due to breaking of disease cycles by peanut rotation in cane farming systems.</li> <li>• Reduced use of chemicals (fungicides) in peanut crops, leading to reduced chemical run-off and associated impacts on biodiversity.</li> <li>• Potential for positive impact on regional wellbeing through reduced chemical run-off to waterways.</li> <li>• Improved farmer wellbeing through reduced chemical use by peanut farmers.</li> <li>• Some improvement in community wellbeing through increased farm income and associated off-farm expenditure.</li> </ul>
<b>Prospective Heat Initiative</b>	
<ul style="list-style-type: none"> <li>• Reduced ongoing yield losses associated with heat events, from accelerated release of new varieties with heat tolerance.</li> <li>• The increase in the capital value of any unexploited wheat germplasm.</li> <li>• Potential benefits and royalties from overseas that may accrue from sale of seed or intellectual property in the future.</li> <li>• Increased profit and reduced variability of net farm income through improved risk management tools, including information regarding choice of sowing date and maturity type and using seasonal heat predictions.</li> </ul>	<ul style="list-style-type: none"> <li>• Regional community impacts from increased grower incomes.</li> <li>• Reduced stress for growers from improved risk management practices.</li> </ul>
<b>Mungbean Breeding Program</b>	
<ul style="list-style-type: none"> <li>• Contribution to the release of four varieties (to date) with higher yields, including some with higher quality and some with improved disease resistance, compared to the varieties they have replaced.</li> <li>• Increase in growers' use of mungbeans in rotations (achieved through increased profitability of mungbeans and availability of more disease-resistant varieties), potentially leading to reduced chemical (herbicides and fungicides) use on farms and reduced fertiliser cost because mungbeans supply more nitrogen compared to other crops that might be used in rotations.</li> <li>• Increase in capital value of mungbean germplasm between 2004 and 2016.</li> <li>• Yield increases and economic benefits to other crops, such as cereals, through improved disease and weed control achieved by maintaining or increasing mungbeans in rotations, due to the availability of new varieties.</li> <li>• Prospective contribution to improved mungbean varieties overseas, via testing methods and genetic knowledge.</li> </ul>	<ul style="list-style-type: none"> <li>• Reduced use of nitrogen fertiliser in crop rotations and associated reduction in greenhouse gas emissions.</li> <li>• Reduced use of chemicals in rotation crops.</li> <li>• Reduced use of chemicals in rotations, including in cotton-growing regions, leading to reduced chemical and nutrient run-off.</li> <li>• Improved farmer and regional wellbeing through reduced chemical use.</li> <li>• Maintained or improved community wellbeing, through increased farm income and associated off-farm expenditure.</li> </ul>
<b>Prospective Water Productivity Initiative</b>	
<ul style="list-style-type: none"> <li>• Increased farm profits through improved productivity, due to a reduction in the yield gap.</li> <li>• Reduced variability of farm profits.</li> <li>• Cost savings through improved research resource allocation.</li> </ul>	<ul style="list-style-type: none"> <li>• Improved management of crop inputs (eg potential reductions in greenhouse gas emissions and chemical or nutrient run-off/leaching to the environment).</li> <li>• Regional community impacts from increased grower incomes.</li> <li>• Reduced stress for growers from improved risk management practices.</li> </ul>



## Farm performance

In order to monitor farm financial performance and productivity trends in the grains industry and other broadacre industries, the GRDC contributes to the funding of a range of surveys and analytical research conducted by ABARES, in particular its annual Australian Agricultural and Grazing Industries Survey.

### Financial performance

The Australian Agricultural and Grazing Industries Survey results for 2014–15 showed that average grain, oilseed and pulse receipts decreased by around 21 percent nationally. This is mainly a result of lower production in all the major grain-producing states, reflecting a decline from the high yields in 2013–14 combined with lower prices for wheat, oilseeds and pulses. Overall, with livestock receipts also lower, average total cash receipts for grain-producing farms decreased by around 8 percent to \$662,000 in 2014–15 from \$719,400 in 2013–14. Specialist grain-producing farms recorded an 11 percent decline in average total cash receipts, to \$844,000 in 2014–15 from \$953,100 in 2013–14.

In particular:

- Nationally, estimated average farm cash income of grain-producing farms declined by around 20 percent from \$213,100 per farm in 2013–14 to \$171,000 per farm in 2014–15, around 24 percent above the 10-year average to 2013–14 of \$137,000 in real terms. Average profit at full equity is estimated to have decreased from \$154,900 in 2013–14 to \$101,000 in 2014–15.
- Estimated average farm cash income of Australian specialist grain producers decreased by 28 percent from \$303,300 per farm in 2013–14 to \$217,000 per farm in 2014–15, 10 percent above the 10-year average to 2013–14 of \$197,000 in real terms. Average profit at full equity is estimated to have decreased from \$256,600 in 2013–14 to \$145,000 in 2014–15.
- Estimated average farm cash income in all three GRDC regions declined in 2014–15 as a result of lower winter grain yields and prices.
- Dry seasonal conditions in the Northern Region resulted in estimated average farm cash income of grain-producing farms falling to \$79,000 per farm in 2014–15, around 24 percent below the

10-year average to 2013–14 of \$105,000 per farm in real terms. If realised, this would be the lowest farm cash income for Northern Region grain-growing farms since 2006–07.

- For Southern Region grain-producing farms, estimated average farm cash income decreased in 2014–15 to \$184,000 per farm, 43 percent above the 10-year average to 2013–14 of \$129,000 per farm in real terms.
- Similarly for Western Region grain-producing farms, estimated average farm cash income decreased in 2014–15 to \$262,000 per farm, 24 percent above the 10-year average to 2013–14 of \$211,000 per farm in real terms.
- Average total cash costs are estimated to have decreased slightly (by around 3 percent) compared with 2013–14, mainly as a result of the lower cost of harvesting and marketing a smaller crop and reduced fuel and interest payment expenditure. Expenditure in most major cost categories is estimated to have decreased, with the exception of crop and pasture chemicals and fertiliser.

### Total factor productivity

Total factor productivity (TFP) measures outputs (crops) relative to total inputs (land, labour, capital, materials and services) used to produce the output. Technological advances, improvements in management, and efficient exploitation of economies of scale all influence the rate of growth in productivity. Accordingly, productivity growth can be driven by producers generating the same amount of output with fewer inputs, increasing output with the same amount of inputs, or increasing output at a faster rate than inputs.

The latest TFP results for broadacre agriculture available from ABARES are for the period between 1977–78 and 2012–13. Results to 2014–15 will become available in two years time.

In the grains industry, productivity growth averaged 1.5 percent a year from 1977–78 to 2012–13, underpinning strong output growth of 2.6 percent a year. Productivity grew strongly until the early 1990s, averaging 3.6 percent a year from 1977–78 to 1988–89. Growth over the two decades to 2012–13 was lower, averaging 1.1 percent a year from 1988–89 to 2000–01 and 1.4 percent a year from 2000–01 to 2012–13.



As shown in Table 8, cropping specialists and mixed crop–livestock farms achieved average annual TFP growth of 1.5 percent and 0.9 percent, respectively, while the broadacre industry average

was 1.1 percent. Table 8 also shows that the TFP growth of cropping specialists was similar across the three grain-growing regions.

**Table 8: Average total factor productivity growth by broadacre industry and GRDC production region, 1977–78 to 2012–13 (% per year)**

	Input growth (1)	Output growth (2)	Total factor productivity growth (2–1)
<b>Industry</b>			
Total broadacre	-1.0	0.1	1.1
Cropping specialists	1.1	2.6	1.5
Mixed crop–livestock	-1.7	-0.8	0.9
Beef	-0.2	1.1	1.3
Sheep	-2.8	-2.6	0.2
<b>Cropping specialists by region</b>			
Northern	-0.7	0.9	1.6
Southern	1.5	3.2	1.7
Western	2.1	3.5	1.4
All regions	1.1	2.6	1.5

Source: Based on data from the Australian Bureau of Agricultural and Resource Economics and Sciences report *Australian grains: Financial performance of grain producing farms, 2012–13 to 2014–15*.

Over the past 36 years, productivity in the grains industry has been driven by:

- technological advances, such as larger and more efficient machinery, Global Positioning System (GPS) guidance systems, new herbicides and pesticides, the ability to make genetic improvements to varieties, and new crop varieties
- improved farming practices, such as low-till and no-till farming, precision agriculture, and ‘cropping packages’ that bring multiple technologies together in readily adoptable farming systems and management practices
- increased average farm size—larger cropping farms tend to be more productive because of their greater capacity to adopt new technologies, particularly advanced cropping technologies that are only suitable for use on farms above a minimum size
- increased skills and knowledge of growers and advisers.



Northern Region growers take part in a GRDC grains research update in Goondiwindi, Queensland, in 2015. Photo: Tom Dixon



# Collaboration

Collaboration is at the heart of the GRDC's approach to enhancing the profitability and sustainability of the Australian grains industry.

## Collaborative projects

Most of the research, development and extension (RD&E) activities described in this annual report were supported by the GRDC in collaboration with research partners, such as government agencies, research organisations, plant breeders, seed companies, agricultural companies and advisers, and grain marketers, exporters and end users.

In particular:

- The reports on performance for the six themes describe collaborations that assisted the GRDC to fulfil its performance objectives and achieve its outcome.
- Appendices B and C provide details of the GRDC's RD&E investments.

## International activities

In June 2015, the GRDC launched a major international collaboration with Bayer CropScience: the Herbicide Innovation Partnership. The partnership will accelerate the discovery and development of innovative solutions to weed management and, in particular, herbicide resistance. It aims to expedite new technologies already in the R&D pipeline and to deliver a new, resistance-breaking technology within 10 to 15 years.

In doing so, it will engage and provide advanced training for many Australian researchers, helping to build the Australian grains industry's research capability for the longer term.

The GRDC continued its partnership with the eXtension Foundation in the United States in 2014–15, in support of the online grains research extension initiative eXtensionAUS. The eXtension Foundation is a non-profit entity that supports knowledge extension, including agricultural research extension, through virtual communities of subject experts and a range of online communication and education resources.

Through eXtension communities, a more direct connection is created between industry and researchers in an audience-responsive and highly interactive learning environment that delivers answers to real problems in real time.

The pilot eXtensionAUS project which commenced in 2013–14 proved highly successful during 2014–15, in building Australian expert communities in the areas of crop diseases and crop nutrition and supporting collaboration to generate extension information and engage directly with industry. The GRDC has invested in the initiative for a further three years, and is now negotiating a new agreement covering strategic, technical and training support, access to system applications, and mutual learning opportunities. The new project will see the GRDC develop a home-grown system that adopts compatible features from the United States and adapts others to better meet Australian needs.



Katherine Hollaway, Project Manager eXtensionAus Field Crop Diseases, describing how the online resource delivered timely, effective information for growers in response to an outbreak of beet western yellows virus in 2014. Photo: Melissa Marino



# CASE STUDY: HERBICIDE INNOVATION PARTNERSHIP

In June 2015, the GRDC launched a major international collaboration, the Herbicide Innovation Partnership, to discover and develop innovative solutions to the challenges of weed management. The partnership is a five-year agreement between the GRDC and Bayer CropScience.

Over many years, GRDC regional panels, grower groups and individual growers have consistently reported that weeds are one of the greatest constraints to grower profitability. Recent estimates show that weeds cost the Australian grains industry more than \$3 billion annually.

Herbicide resistance is the single most important reason for crop losses around the world, raising costs and threatening food security. Collectively, more than 245 resistant weed species affect 86 commercial crops across 66 countries. Australia has the second-highest number of herbicide-resistant weeds, after the United States, and the most severe impact of herbicide resistance on cereal production.

Since the great success of glyphosate and glyphosate-resistant crops in the 1990s, the international focus on herbicide research has severely declined. No new mode of herbicide action with global significance has been launched in more than 20 years. Combined with the unforeseen rate of herbicide resistance development, this has created an innovation gap that no one company or research institution could cover.

Bayer CropScience has remained a world leader in weed control research, covering the spectrum of herbicide technologies. In particular, the company's 'safener' chemistry provides an advantage in the development of herbicides that have minimal negative impact on the productivity of crop plants.

The Herbicide Innovation Partnership will extend research capacities at Bayer CropScience's research centre in Frankfurt, Germany. This will include the engagement of 39 additional researchers, many of whom will be recruited in Australia. The partnership will also provide postdoctoral training in advanced industrial research techniques for up to 30 Australian researchers over the project's life, building Australia's research capability for the long term.

The collaborative approach maximises the probability of discovering new herbicides of relevance to Australian cereal cropping, and gaining registration for their use in Australia, as quickly as possible. The project will look at weeds of particular concern in Australia, such as annual ryegrass and wild radish.



(From left) Adrian Percy, Bayer CropScience Head of Research and Development, Richard Clark, GRDC Chair, and Barnaby Joyce, Minister for Agriculture and Water Resources, at the signing of the Herbicide Innovation Partnership agreement on 2 June 2015 at Parliament House, Canberra. Photo: Jez Rozdarz

The aim is to deliver a new, resistance-breaking technology within 10 to 15 years. Development of weed control products already in the R&D pipeline will be accelerated, to provide growers with additional tools for sustainable weed management even earlier.

As an additional benefit, any fees and royalties flowing to the GRDC through the commercialisation of new products will be reinvested into new research, development and extension on behalf of Australian growers.

The partnership is a key element of the GRDC's suite of investments to deliver new options for integrated weed management that improve the profitability and sustainability of Australian grains production.



# Theme 1 – Meeting market requirements

This theme describes the framework for the GRDC's investments in grain quality and functionality to help growers maintain and expand access to markets.

Australia's domestic and international customers seek a consistent supply of grain that is both:

- a quality product that is compliant with statutory and customer-specific requirements
- a functional product that performs reliably for the desired end use.

To deliver the highest value to growers, the GRDC must understand the requirements and the dynamics of current domestic and export markets for feed and food grains, and those of likely future markets.

Through the 'Meeting market requirements' theme, the GRDC interacts closely with participants in the Australian grains value chain to better understand market requirements, particularly for quality and functionality, to enable growers to maintain or increase access to current markets, and secure access to new higher valued markets.

The following sections describe some highlights of RD&E investments that addressed this theme in 2014–15.

## Competing varieties in export wheat markets

To help the grains industry understand and build the value of Australian wheat in export markets, the GRDC is supporting research to source and test the quality of key competitor grades and varieties.

The project is benchmarking samples of major Australian wheat grades against samples from Argentina, Canada, France, Germany, India, Japan, Kazakhstan, Russia, the Ukraine and the United States.

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Obtaining usable samples is a complex task, partly because of source countries' export controls. The project is working with Biosecurity Australia to refine the terms of the quarantine permit to overcome such obstacles. Maintaining Australia's high standards for quarantine on arrival is also an important aspect of the project. Many of the samples obtained so far have been held up at inspection due to the presence of weed seeds. Several of the samples have had to be cleaned before being released to the researchers.

Where appropriate, the project is working with researchers overseas to improve access to test material. For example, because of Japan's restrictions on the export of grain samples, Australian noodle varieties are being sent to Japan to be tested against Japanese varieties. Assessments of grain quality and milling properties, and sensory evaluation of udon noodles, have been completed in Japan. Assessments of flour quality and dough rheology will be completed by the Australian Export Grains Innovation Centre in Perth.

The majority of the testing of major Australian wheat grades and international samples received in the first year of the project has been completed, with testing of further international samples scheduled for completion by the end of 2015.



## Late maturity alpha-amylase

Late maturity alpha-amylase (LMA) is a genetic defect of wheat which can be triggered by environmental conditions. When triggered, LMA can result in grain with a low Falling Number that fails receival and export specifications, affecting financial returns for growers and prospects for export markets. Due to the risk of downgrading in quality at receival, LMA is included in the wheat variety classification process.

LMA is difficult to phenotype and, because it can be caused by a range of genetic combinations, the incidence and severity of its expression have been almost impossible to predict. Australian wheat-breeding programs (and many overseas programs) currently carry the defect in at least 20 percent of their breeding backgrounds. Effective tools for the management of LMA are needed to ensure that growers and the wider Australian grains industry are not exposed to undue risk, now and in the longer term.

The GRDC has significant ongoing investment in LMA-related projects, to:

- determine the impacts of LMA on end product quality and other important traits
- identify the mechanisms and genes that are involved in LMA susceptibility and resistance
- develop better screening tools for breeders, including molecular markers for the several known quantitative trait loci (QTL) for LMA
- model the field risk of LMA occurrence by region and climate for varieties carrying various combinations of those QTL
- develop improved screening methods, including alternatives to the current protocol accepted by Wheat Quality Australia for wheat classification
- provide recommendations to Wheat Quality Australia on an appropriate scoring system for field risk of LMA, taking into account location and genotype
- enable phenotyping and screening of advanced breeding lines from Australian companies to provide accurate characterisation of risk and data for variety classification.

Data for more than 2,500 breeding lines submitted by Australian breeding companies between 2011 and 2013 has been analysed according to a stringent statistical regime developed by Statistics for the Australian Grains Industry and approved by Wheat Quality Australia as being suitable for variety classification.

In 2014–15, GRDC-supported research made particular progress on:

- mapping the genetic basis for LMA expression, and developing new screening procedures, information and molecular tools—including identification of QTL and quantitation of their effects in tall and semi-dwarf backgrounds—to reduce the impact of LMA
- developing a biochemical model of the mechanisms associated with LMA expression, focusing on the role of the plant hormone gibberellic acid
- quantifying the effects of LMA on end-use qualities such as dough stability.

## Stored-grain pests

Damage caused by insects to grain in storage results in significant loss of product and reduction in quality and market value. Insect damage is among the key threats to grains industry production and exports, and to the security of food supply. Australian grain exports have zero tolerance for live insects.

### Detection

Early detection of infestation can reduce the need for chemical intervention and prevent substantial losses. This is becoming increasingly important as export markets begin to demand grain free from chemical residue.

A GRDC-supported project is focusing on the development of an acoustic system for detecting and monitoring biohazards in stored grain. The system will monitor grain storage systems around the clock, and quickly identify the early stages of any infestation. By identifying the infesting insect species, the system will allow targeted controls to be implemented at the first sign of infestation, heightening their effectiveness.



The work includes developing customised hardware and software for the grain storage environment. To develop the optimum acoustic sensor, the project is testing a range of existing sensors in relevant grain stocks, including barley, canola, oats, rice, sorghum and hard and soft wheats.

The researchers are also developing a database of digital audio files that will enable the system to classify the most common stored-grain insect pests according to species, life cycle and behaviour; environmental conditions; and population and distribution.

As a starting point in the development of digital signatures for particular pests, the project has obtained access to an extensive database of recordings through a collaborative arrangement with the United States Department of Agriculture.

Grain growers in York, Western Australia, have welcomed researchers to their farms to collect recordings of background noise in grain silos under a range of environmental conditions, and provided wheat samples for use in laboratory experiments.

As well as preventing grain losses, a successful acoustic-based biohazard detection system for grain storage has potential to reduce time and expense related to managing and maintaining detection, identification and monitoring programs, and the costs associated with pesticide use and withholding periods for treated grain.

## Treatment

Resistance to conventional pesticide treatments (such as phosphine fumigation) in multiple species of stored-grain pests represents a major potential problem for the cereal grains industry.

One of the most promising solutions to this issue is the use of naturally occurring diatomaceous earth (DE). DE kills insects through a physical mode of action: by removing waterproofing waxes from the surface of the insect, it leads to uncontrolled loss of water and, ultimately, death by desiccation.

DE has many advantages: it is non-toxic to humans, environmentally friendly and relatively inexpensive, and it has a low potential for resistance development. However, DE has not been widely used for grain protection in Australia, because the high dose required for insect control causes unwanted changes in grain properties, such as decreased bulk density and grain flowability.

The GRDC is supporting a project to address these issues by improving the insecticidal efficacy of DE, thereby reducing the dose required. The project is adopting a multidisciplinary approach that combines expertise across physical chemistry, synthetic chemistry, nanotechnology, biology and agricultural engineering, to develop new advanced DE-based formulations for grain protection.

In initial testing, several approaches to enhancing DE's mode of action have been considered. The effectiveness of the new formulations has been tested when applied dry or wet to bulk grain; applied to structural surfaces such as steel or concrete; and combined with very low oxygen levels.

Preliminary studies have shown that new formulations based on combining DE with naturally derived insecticidal compounds are capable of protecting grain from pesticide-resistant insects at much lower doses than leading natural insecticide products currently on the market. Work is now underway to develop a superior product for commercialisation.



Entomologist Lijun Cai is researching the use of amorphous silica to control phosphine-resistant stored-grain pests, at Murdoch University in Western Australia. Photo: Jeff Russell



# CASE STUDY: PHYSICAL AND FUNCTIONAL QUALITIES IN PULSES

In 2016, the Australian grains industry will join the celebration of the United Nations International Year of Pulses, marking the crucial contribution that pulses make to nutrition and food security around the world.

In Australia, pulses play an important role as break crops in cereal rotations, and as cash crops in their own right. The GRDC supports research to help Australian growers optimise the returns for their pulses in high-value export markets.

The key factors that determine the market value of pulses relate to the physical characteristics of the seed, such as size, shape, coat colour and seed coat defects. In the past, the mechanism for assessing those characteristics involved time-consuming, labour-intensive sieving of large samples of grain. Such samples could only be obtained in the late stages of a breeding program, depriving breeders of the opportunity to cull for physical traits early, which was both costly and inefficient.

A GRDC-supported project has developed an alternative method, based on digital image analysis, that can rapidly process samples of almost any size. As seeds pass through a digital camera unit, the camera captures an image of each seed and computer analysis of the image delivers a profile of the traits of that seed, which is compared to models of key traits to assess the seed's quality. The system is non-destructive and can assess the size, shape and colour of around 1,500 seeds in three minutes.

Since 2014, the project has been working with varieties from Pulse Breeding Australia (PBA) breeding programs—including chickpeas, faba beans, field peas and lentils—to improve the accuracy of the models and the range of traits that can be measured. Recent examples include enhanced abilities to assess seed coat discoloration due to disease or weather; and to determine seed volume and predict seed weight, based on seed-coat texture.

In January 2015, digital image analysis was successfully implemented in the PBA field pea and lentil breeding programs, achieving more than 98 percent accuracy in measuring seed size distribution and 100-seed weight. Analyses of more than 600 samples from breeding trials were completed within three weeks. This enabled breeders to make selections for quality traits prior to sowing, for the first time—providing a full season's advantage over the traditional seed-sieving methods.

Ultimately, the technology will be adapted for use at grain receipt, where grain quality attributes and defects such as seed damage, insect damage and harvest damage are currently measured subjectively by silo operators. More precise assessment of grain quality should deliver more accurate prices for growers.

Other GRDC investments are exploring ways to improve returns for Australian growers by developing pulse varieties with functional attributes that are sought in overseas markets. A recent example was research that identified potential to improve the 'puffability' of Australian chickpeas. Puffed chickpeas are widely consumed in India and, as a healthy, oil-free snack, have potential to expand into lucrative niche markets in other countries.



Joe Panozzo and Linda McDonald are developing high-throughput digital analysis technology for determining grain quality traits in pulses, at Grains Innovation Park in Horsham, Victoria. Photo: Simone Dalton



**Table 9: Theme 1 performance against GRDC strategic measures**

Theme 1 – Meeting market requirements	
<b>Aspirational outcome (10+ years)</b>	<i>Australian grain growers maintain and increase access to current and future grain markets by aligning on-farm production practices with quality and functionality requirements.</i>
<b>Intermediate outcomes (5 years)</b>	
<b>Understanding market opportunities for Australian grain</b>	Acquisition and interpretation of information about market requirements, trends and opportunities, in order for the GRDC to make informed RD&E investment decisions and to assist grower decisions.
<b>Crop and variety selection aligned with market requirements</b>	Growers use market information to select crop, variety and cropping sequence that addresses their profit and risk.
<b>Crop production aligned with market requirements</b>	Growers use information on appropriate in-crop management to maximise the potential of delivering grain that meets the quality and functionality requirements of the intended customer.
<b>Grain harvest and storage practices aligned with market requirements</b>	Growers adopt harvest and storage practices to maximise their potential to deliver grain that meets the quality and functionality requirements of the target market.
<b>Expenditure for 2014–15</b>	\$18.44 million
Performance for 2014–15	
<b>Understanding market opportunities for Australian grain</b>	
<b>Practice changes and key metrics</b>	
<ul style="list-style-type: none"> <li>• The GRDC establishes relationships with the value chain and regulatory authorities to access information about market requirements, trends and opportunities.                             <ul style="list-style-type: none"> <li>– <i>Australian Export Grains Innovation Centre joint venture is established and operating appropriately.</i></li> </ul> </li> <li>• The GRDC makes greater use of information on current and potential future markets to guide investment decisions.</li> </ul>	
Targets	Achievements
The Australian Export Grains Innovation Centre (AEGIC) is established in Perth and undertakes a number of activities, including conducting research, holding grower and industry workshops, and producing reports on specific export markets and the development of direct relationships with exporters, end-users and government.	<p>AEGIC refocused on areas of clear market failure with strong industry engagement and support, particularly in technical market services, market intelligence, and crop quality and functionality.</p> <p>AEGIC’s intelligence projects highlighted markets in which Australia needs to defend its share, and new or expansion opportunities. A number of reports were made available on AEGIC’s website.</p> <p>AEGIC also established a partnership with Austrade to train business development managers with specific grains expertise. AEGIC now has a presence and contact person in key markets for wheat, barley, oats and canola, with other crops to follow.</p>
Reports from a joint project with Grain Growers Limited help to define new investment in the ramen and white salted noodle markets of Japan and Korea.	Research identified and ranked the most, least, second-most and second-least important characteristics of 31 wheat characteristics for udon noodles and for ramen. It clarified what was required for market access and which characteristics could attract premiums, and verified that the difference between Australian Standard Wheat and noodle wheat is still valid in the marketplace.
New investments in gathering market information in key wheat markets are contracted for 2014–15.	Four new projects were contracted to gather objective intelligence on the characteristics preferred for products in the major export markets for wheat, durum and other crops, and to evaluate the quality of Australian wheat varieties and grades and their competitors.
Greater than 70% of participants in the wheat and barley crop value chains engage in the relevant variety quality accreditation processes.	Achieved.



**Table 9: Theme 1 performance against GRDC strategic measures** *(continued)*

Performance for 2014–15	
<p><b>Crop and variety selection aligned with market requirements</b></p> <p><b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>• A greater proportion of growers and advisers use market information to inform crop and variety selection.</li> <li>• Increased interaction between grains industry participants (growers, pre-breeders, breeders and value chain participants) and regulatory authorities creates awareness of the quality and functionality market access requirements.</li> <li>• Breeders and pre-breeders use market information to deliver varieties that meet the requirements of current and future markets.                     <ul style="list-style-type: none"> <li>– <i>Independent wheat variety classification is maintained.</i></li> </ul> </li> </ul>	
<b>Targets</b>	<b>Achievements</b>
A farm survey is undertaken to provide baseline data on the use of market information by growers.	The farm survey report delivered in June 2015 highlighted needs to assist growers with cropping plans, risk management and quality assurance, and to demonstrate how documenting quality well can assist in achieving a higher sale price.
Investments are in place to deliver information on the quality requirements by crop type that will inform the GRDC and the breeding community for each crop.	A market intelligence investment to gather objective information on the characteristics needed for preferred product quality in the major export markets for wheat, barley, canola, maize, sorghum, lupins, field peas, mungbeans, chickpeas and lentils commenced in May 2015. It will deliver a model to rank the characteristics based on market valuation, and information to guide decision making.  An investment to identify and develop oat quality for export markets was contracted to commence in July 2015.
Practical, accurate and cost-effective tools to identify wheat lines that have genes for late maturity alpha-amylase so these lines can be deselected by wheat breeders are available for delivery by 2017.	A suite of markers for late maturity alpha-amylase was delivered to Australian wheat breeders to assist their selection decisions in 2015, and fine mapping work was accelerated.
The GRDC supports both the Wheat Quality Australia wheat classification process and an improved variety accreditation process for malting barley.	The GRDC maintained support for Wheat Quality Australia and Barley Australia and—through projects focused on zone boundaries, classification standards and pre-release quality testing—worked closely with these agencies to refine classification standards to deliver better varieties to growers faster.
The ultra-low gluten barley project has progressed to a semi-commercial stage and commercial partners are being sought.	The commercial partner has been identified and the project is proceeding to commercial stage.
<p><b>Crop production aligned with market requirements</b></p> <p><b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>• A greater proportion of growers and advisers use relevant market information to inform decisions about in-crop management practices.</li> <li>• A greater proportion of grain growers adjust pest, weed and disease management practices to meet market requirements.</li> </ul>	
<b>Targets</b>	<b>Achievements</b>
Information packages on quality management are added to the variety-specific agronomy packages being delivered through other GRDC investments.	GRDC GrowNotes provided summaries of practices to achieve quality in crop and in the harvest, storage, seed preparation and transport of grain. The barley variety sowing guide and South Australian crop variety guide provided information on quality and agronomy.  Further, variety-specific agronomy packages for the southern, central and northern New South Wales regions are being developed.



**Table 9: Theme 1 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
<p>The GRDC works with Grain Trade Australia (GTA) to ensure that growers are aware of the key issues regarding the delivery of grain to market specifications, including in relation to maximum residue levels, weed seeds and snails.</p>	<p>Through representation with national and international regulatory authorities, the GRDC and GTA ensured that the grains industry remains fully aware of regulatory requirements, and maximum residue limits are maintained for chemicals that are vitally important for the on-farm, post-harvest storage of grain.</p> <p>The GRDC and GTA also:</p> <ul style="list-style-type: none"> <li>assisted the Grains Industry Market Access Forum to produce an industry management plan to supply wheat and barley to China</li> <li>provided technical assistance in the production of a stewardship guide on safely managing risks with crop inputs and grain on farm</li> <li>assisted the Australian Oilseed Federation to produce a document on minimising the incidence of <i>Leptosphaeria maculans</i>.</li> </ul>
<p><b>Grain harvest and storage practices aligned with market requirements</b></p> <p><b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>A greater proportion of growers use harvesting strategies that maximise the opportunity to meet the requirements of their target market.</li> <li>A greater proportion of growers are aware of the quality and functionality of the grain delivered to their customer or entering contract storage. <ul style="list-style-type: none"> <li>90% or more of growers are aware of and interested in the benefits of measuring grain quality.</li> </ul> </li> <li>A greater proportion of growers use storage practices to meet market requirements and provide for the continued effectiveness of pest control measures. <ul style="list-style-type: none"> <li>At least 60% of growers storing grain on farm use sealed silos.</li> </ul> </li> <li>The GRDC uses market access information to provide growers with the harvest and storage management packages and tools to comply with market requirements.</li> </ul>	
Targets	Achievements
<p>Information packages on harvester set-up and grain moisture management are developed for inclusion in grower workshops.</p>	<p>Workshop materials included information on harvester set-up and grain moisture management.</p>
<p>By 2016, grain specification and defect charts are available to growers and industry for all major and minor crops and are annually revised.</p>	<p>Grain specification and defect guides for barley, wheat, sorghum, oats, canola, desi chickpeas, kabuli chickpeas, feed maize, angustifolius lupins, red lentils, field peas and faba beans were made available through GTA.</p>
<p>Grain storage extension workshops, with a focus on the economics and market strategies of storing grain, are highly successful in informing growers of the best methods for managing grain in storage.</p>	<p>The GRDC delivered six grain storage workshops to 185 participants, including one workshop focused on grain storage economics, in 2014–15, bringing the total over the Grain Storage Extension Project’s duration to 345 workshops delivered to 8,010 participants, including 48 workshops focused on grain storage economics.</p> <p>Post-workshop surveys in 2014–15 found that participants had improved or planned to improve practices for phosphine use (76% of participants), aeration cooling (59%) and grain storage hygiene (84%), and 77% of participants applied or intended to apply economic rationales to their grain storage decisions.</p>
<p>By 2017, 70% of growers are implementing quality assurance (QA) systems in response to market requirements to substantiate and manage the quality of the grain they deliver.</p>	<p>The On Farm Grain Storage Study 2014 showed that 22% of growers have a QA program in place.</p> <p>A scoping study was conducted, to understand drivers for uptake of QA, through the stakeholders involved in the planning, growing, harvesting, storage and sale of grain. The final report, to be delivered in September 2015, will document the ideal QA procedures required at all stages from growing seed to final sale; identify key stakeholder groups; and assess QA data collection and recording issues.</p> <p>A booklet summarising current status will be released in July 2015 in hard copy and on the Grain Producers Australia website.</p>



**Table 10: Theme 1 performance against portfolio budget statements measures for 2014–15**

Key performance indicator	Target	Result
Australian Export Grains Innovation Centre (AEGIC) joint venture is established and operating appropriately.	Required market information available.	Achieved. AEGIC's strategic focus was refined.
Growers are interested in the benefits of measuring grain quality to meet customer requirements.	90%	A 2014 survey found that growers recognised the top three benefits of on-farm testing as providing information about the markets their grain can supply (34%), what the grain can be sold for (32%), and the effectiveness of their cropping programs (20%). Of the growers surveyed, 81% tested for moisture, but 82% did not test for protein: 40% because their grain buyer does that, and 34% because of the cost of equipment.
Growers storing grain on farm use sealed silos to meet market requirements and provide for the continued effectiveness of pest control.	65%	A 2014 survey found that 31% of storages used on farm were sealed silos. A survey to follow up on implementation after grain storage workshops found that 50% of workshop attendants understood that it is imperative that silos are gas-tight sealable, as shown by pressure testing, to prevent pesticide resistance from developing. Further extension work is underway.

## What's in the RD&E pipeline for 2015–16?

- A multi-pronged approach to resolve the issue of late maturity alpha-amylase.
- Objective data and analysis to inform solid business cases, including paths to market, for GRDC investments.
- An initiative to assist growers to capture value from feed grains.
- A continuing focus on improving grain storage practices and stewardship.



PhD student Rebecca Barnett is investigating the inconsistency in protein levels found in canola meal, a feed supplement for dairy cows, at the Australian Research Council Industrial Transformation Training Centre for Functional Grains. Photo: Neeta Karve



# Theme 2—Improving crop yield

This theme describes the genetic approaches and associated tools and technologies that can be applied to produce varieties with increased water-limited yield potential (WLYP).

The WLYP of a variety is the maximum yield attainable when the variety is grown under average, rain-fed conditions without the limiting impacts of nutrient deficiency, soil toxicity, weed competition, insect damage and disease.

Although the actual yield that is captured on farm depends on a grower's ability to manage the biotic and abiotic factors that contribute to yield losses (and the cost limitations of management practices), WLYP is genetically determined.

Plant breeders aim to continually improve the WLYP of crops through new varieties. However, for many crops, continued improvements in genetic yield potential and stability are becoming harder to realise.

The 'Improving crop yield' theme focuses on the delivery of new crop varieties with demonstrable improvements in genetic yield potential and yield stability. Given the wide range of farming environments and crop choice, targets will be crop specific and region specific.

The following sections describe some highlights of RD&E investments that addressed this theme in 2014–15.

## Water-limited yield potential in wheat

There has been much discussion about the potential for manipulating physiological traits to improve WLYP in wheat and other crops. However, before breeding programs will embrace new traits, the traits must be validated in relevant field environments; the possible economic benefits of the traits must be demonstrated; and breeders must have the tools they need to efficiently incorporate the traits into their breeding lines.

The GRDC supports research to improve understanding of key traits in wheat, assess their relative value in improving yield and deliver improved germplasm to breeding programs.

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### Trials in controlled environments

The GRDC's three managed environment facilities, at Narrabri and Yanco in New South Wales and Merredin in Western Australia, provide a unique opportunity for researchers to test the effects of traits on WLYP under a range of rainfall regimes, including drought.

The facilities deliver the capacity to screen diverse germplasm for complex genetic and physiological traits, in a manner that is repeatable and unique to each of the regions in which the facilities are located. Importantly, the value of the traits is assessed in commercially relevant genetic backgrounds, side by side with the best commercial varieties and advanced breeding lines.

Among the different traits assessed in wheat so far, the greatest average yield benefit for growers appears to be in selection for early-to-mid flowering (13 percent to 14 percent), greater early vigour (11 percent), cooler canopies (9 percent) and maintenance of stay-green via leaf-rolling (8 percent). The benefit of selection for stem carbohydrate and carbon isotope discrimination can be as high as 8 percent, but appears to depend heavily on the background under selection and the environment or region for which selection is being targeted.

Germplasm containing these traits in relevant genetic backgrounds has been delivered to Australian commercial wheat breeders.



## Modelling

Traits that may have potential to improve WLYP in wheat are physiologically and genetically complex, and their impact depends on their environment, genetic background, and interactions with other traits. While field trials can evaluate a small range of variables, computer modelling provides the potential to estimate the value of traits for a large number of environment, management and genotype combinations.

Australia's APSIM (Agricultural Production Systems sIMulator) is an internationally recognised decision support tool that simulates interactions in agricultural systems. The GRDC is supporting a project to develop the APSIM wheat model to evaluate the value of three major traits affecting WLYP: early vigour, transpiration efficiency, and water-soluble carbohydrates.

Demonstration trials are being undertaken to evaluate lines with various water productivity traits and characterise differences in trait expression, biomass and yield. Evaluation and modelling trials are focusing on a small subset of lines identified in the demonstration trials, to better understand trait responses and interactions between traits.

The results of the 2014 trials have been collated with datasets from previous related research and organised into databases that can be used to efficiently calibrate and evaluate crop models. The performance of the new model has been validated through APSIM, and tools have been developed to convert the new datasets into simulations.

## National Frost Initiative

The National Frost Initiative, which commenced in 2014–15, is a major GRDC investment in addressing the impact of frost on Australian cropping, through:

- genetics—developing more frost-tolerant wheat and barley germplasm, and ranking current varieties for frost tolerance
- management—investigating whether agronomic measures such as stubble or nutrition management practices, or other measures, could reduce the impact of frost
- environmental forecasting—predicting the impact of frost events on crop yields and mapping frost events at the farm scale, to help growers manage frost risk.

## Variety development

Spring frosts that coincide with flowering can inflict particularly heavy economic losses on cereal growers, because they severely affect yield and occur at a stage when considerable resources have been committed to establishing the crop. Wheat and barley are most vulnerable to frost during flowering.

The GRDC is supporting research to identify genetic sources of frost tolerance that could be used to develop wheat and barley varieties that can tolerate frost at flowering, thus reducing or eliminating the impact of spring frosts.

One project is conducting trials of more than 420 wheat genotypes at two frost-prone sites, at Greenethorpe in the central west of New South Wales and Wickpepin in Western Australia. Neither site is irrigated. The researchers use three times of sowing, including two early sowing dates, to ensure that flowering is likely to coincide with severe frost.

After flowering, the extent of frost damage is scored for each genotype, along with plot yield. The resulting data will be used to determine the heritability of variation in frost damage and whether it is possible to map genetic differences in frost-induced sterility.

Preliminary results from 2014 suggest that genes that control awn development have a large impact on frost tolerance and that selection of awnless wheats might be a simple strategy to reduce frost damage to wheat crops.

## Nutrient management

There is increasing evidence that improving the potassium status of soils can alleviate the effects on crops of a range of abiotic stresses, including drought, salinity and sodicity, and frost. All these stresses are prevalent in the Western Region, where up to 50 percent of soils are deficient in potassium and frost damage is a major threat to grains production.

Recent GRDC-supported research has developed an APSIM module for simulating wheat responses to potassium on soils in the Western Region, and identified the critical levels for soil testing to predict which soils are deficient in potassium. The GRDC is now supporting research to help growers to better utilise soil testing and apply potassium and micronutrient fertilisers to increase crop productivity in frost-prone environments.



In 2014, five trials were conducted at three frost-prone sites in the Western Australian wheat belt, to assess how increased concentrations of potassium and trace elements (including boron, copper, zinc, manganese and molybdenum) would affect frost tolerance in wheat. Nutrients were applied to the soil and foliage.

Frost events were unusually mild and rare at the test sites in 2014, limiting the findings in regard to frost damage at critical stages of crop growth. However, the trial results indicated that frost-induced sterility was reduced by potassium added to the soil, and by foliar application of potassium, copper and boron. Both potassium treatments and trace element treatments increased grain yield.

## Genetic improvement of canola

Canola is the third-largest crop in Australia, after wheat and barley, and the major oilseed crop. Australian canola is grown mainly for export, and scope exists for Australia to significantly expand its share of the world canola market.

The GRDC supports the National Brassica Germplasm Improvement Program, which aims to ensure that Australian growers can compete in world markets, and that the Australian canola industry remains viable in the long term, by addressing constraints to canola production.

The program is currently focused on the development of enhanced germplasm which improves canola's:

- drought tolerance
- heat tolerance
- resistance to pod shattering
- resistance to and tolerance of blackleg disease.

GRDC-supported research is developing molecular markers that will assist canola breeders to rapidly incorporate novel and desirable agronomic and quality traits into their advanced breeding lines or established varieties.

The Australian Canola Molecular Marker Program has:

- identified genes associated with drought resistance, and analysed QTL associated with water-soluble carbohydrates and carbon isotope discrimination

- investigated the genetic basis of natural variation for pod shatter resistance
- identified several genomic regions associated with seedling and adult plant resistance to blackleg disease, and validated a suite of molecular markers as predictors of resistance.

Blackleg, caused by the fungal pathogen *Leptosphaeria maculans*, is an ongoing significant threat to canola production in Australia. It is highly prevalent, particularly in areas where canola is grown intensively, and affects both crop yield and grain quality. Because the blackleg pathogen mutates readily and has the ability to overcome resistance relatively quickly, canola breeders and growers are continually looking for new sources of resistance.

A GRDC-supported project is working to identify genetic sources of blackleg resistance in *Brassica oleracea* and *B. rapa*, two relatives of cultivated canola (*B. napus*), and incorporate them into germplasm for canola breeders. The project commenced in 2007 and delivered more than 320 lines with improved blackleg resistance to Australian breeding companies in its first five years. More than 1,000 samples have been screened so far.

The second phase of the project has identified several *B. oleracea* and *B. rapa* lines that have resistance to blackleg at the seedling stage. Those selections are being developed to produce more seed for future studies, and to validate the resistance patterns in some of the selections. The project is also working on a method for screening adult plants for blackleg resistance.



Plant pathologists Steve Marcroft, from Marcroft Grains Pathology, and Kurt Lindbeck, from the New South Wales Department of Primary Industries, are developing new strategies for managing blackleg in canola. Photo: Felicity Pritchard



# CASE STUDY: CHILLING TOLERANCE IN WHEAT

The damage that spring frosts can cause to wheat crops is well recognised, but the effects of the chilling conditions that precede frosts are less well understood.

Chilling causes sterility and grain loss. However, it also provides the opportunity for the wheat plant to adapt to cold conditions by making substances (such as sugars) that protect plant tissues against ice formation. This adaptation response (acclimation) reduces the potential for damage during frost events.

A recent GRDC-supported project explored the questions:

- How damaging are chilling conditions in wheat?
- Is chilling tolerance correlated with improved frost tolerance?
- How important is acclimation in preventing frost damage in wheat, and is there genetic variability in the basis for acclimation?

The project used model wheat lines from the National Frost Initiative and conducted a range of experiments in a controlled environment. Lighting was adjusted and temperature was gradually reduced from 21°C to -3°C over six hours and then held at -3°C for six hours, to replicate a typical August night in Western Australian field conditions.

Working in the controlled environment allowed the researchers to:

- establish that chilling, non-freezing temperatures cause grain loss of up to 50%
- discover which stage of growth is most sensitive to chilling
- identify wheat lines that are tolerant of or sensitive to chilling, and study the physiological and molecular bases for tolerance and sensitivity
- study the acclimation response to cold and understand the correlation between cold and frost tolerance
- examine environmental factors that interfere with chilling and frost tolerance and contribute to inconsistencies between field trials.

Natural frost events during flowering are unpredictable and vary in frequency, duration and severity. This leads to variability in the ranking of lines in National Frost Initiative field trials. Frost conditions are also very difficult to simulate in controlled environments.

The project ranked wheat lines according to their chilling tolerance in the controlled environment, and found that the rankings were consistent with the frost-tolerance rankings of the same lines under field conditions. This suggests that measuring chilling tolerance under controlled conditions has potential to become a more reliable surrogate for field trials in phenotyping for frost tolerance.

The research also showed how some environmental parameters might affect the performance of varieties under cold conditions in the field. For example, high relative humidity (dew and condensation) was found to affect pollen fertility and grain production, and exacerbate the effects of cold. Far-red light was found to improve cold acclimation.

The project has provided a better understanding of the physiological, molecular and genetic basis of acclimation and how it correlates with frost tolerance, as a useful basis for new strategies for phenotyping, and enhancing, frost tolerance in wheat.



Frost causes sterility and grain loss in wheat, leading to significant economic impacts for growers. Photo: Ian Foster



**Table 11: Theme 2 performance against GRDC strategic measures**

Theme 2—Improving crop yield	
<b>Aspirational outcome (10+ years)</b>	<i>Cereal, pulse and oilseed varieties with significant, sustained and stable improvements in water-limited yield potential over current elite varieties in key agroecological zones and across a range of seasons.</i>
<b>Intermediate outcomes (5 years)</b>	
<b>Genetic yield potential and stability improvement of cereal varieties</b>	Growers access and increase production of adapted cereal varieties with a significant yield potential and stability increase over current elite varieties.
<b>Genetic yield potential and stability improvement of pulse varieties</b>	Growers access and increase production of adapted pulse varieties with a significant yield potential and stability increase over current elite varieties.
<b>Genetic yield potential and stability improvement of oilseed varieties</b>	Growers access and increase production of adapted oilseed varieties which continue to meet target oil levels with a significant yield potential and stability increase over current elite varieties.
<b>Expenditure for 2014–15</b>	\$36.10 million
Performance for 2014–15	
<p><b>Genetic yield potential and stability improvement of cereal varieties</b>  <b>Genetic yield potential and stability improvement of pulse varieties</b>  <b>Genetic yield potential and stability improvement of oilseed varieties</b>  <b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>• Breeders and industry pre-breeders increase their level of collaborating to identify and prioritise traits, tools and germplasm requirements to support target gains in yield potential and stability. <ul style="list-style-type: none"> <li>– <i>New cereal varieties have minimum yield increases equivalent to 1% per annum as measured in National Variety Trials (NVT).</i></li> <li>– <i>New pulse varieties have minimum yield increases equivalent to 2% per annum as measured in NVT.</i></li> <li>– <i>New oilseed varieties have minimum yield increases equivalent to 1.5% per annum as measured in NVT.</i></li> </ul> </li> <li>• Increased number of pre-breeders develop priority traits in breeder-defined genetic backgrounds, and ready-to-implement selection tools to drive rapid adoption by breeding programs.</li> <li>• Increased number of breeders and pre-breeders use accurate data analysis methods to interpret yield potential, stability and environmental data that informs selection for target production environments.</li> <li>• Growers and their advisers have greater access to and make greater use of accurate, regionally relevant yield potential and stability data to choose an improved variety. <ul style="list-style-type: none"> <li>– <i>New varieties currently available meet the expectations of at least 60% of growers.</i></li> <li>– <i>40% of growers and their advisers use the NVT online data or attend an NVT field day, and of these 90% consider that the information obtained helped them in deciding which varieties to plant.</i></li> </ul> </li> </ul>	
Targets	Achievements
Wild <i>Cicer</i> lines from a 2013 mission to collect germplasm from Turkey are imported and curated to be used for Australian chickpea breeding and pre-breeding.	A total of 164 <i>Cicer</i> lines were imported through the Australian Grains Genebank, comprising: <ul style="list-style-type: none"> <li>• five <i>C. arietinum</i> lines</li> <li>• 35 <i>C. echinospermum</i> lines</li> <li>• 124 <i>C. reticulatum</i> lines.</li> </ul> The germplasm is now accessible to Australian chickpea breeding and pre-breeding programs.
International wheat germplasm with potentially enhanced frost tolerance is selected and imported.	A total of 231 wheat landraces, including selections from the United States Department of Agriculture and the International Center for Agricultural Research in the Dry Areas (ICARDA), were imported and multiplied. The germplasm will be screened for frost tolerance in 2016.
An Australian pastures genebank is established.	The Australian Pastures Genebank was established. The national facility is being hosted at the South Australian Research and Development Institute's Plant Research Centre in Adelaide. It combines relevant seed and data from all significant state-based pasture and forage centres, and is the hub for pasture and forage plant genetic resource activities in Australia.



**Table 11: Theme 2 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
A new phase of the National Brassica Germplasm Improvement Program, targeting industry and breeder defined canola production traits, is developed.	A new five-year phase of the National Brassica Germplasm Improvement Program commenced working on genetic improvement of canola to enhance: <ul style="list-style-type: none"> <li>• resistance to blackleg</li> <li>• tolerance to drought, heat and shatter</li> <li>• oil yield and stability.</li> </ul>
An in-vitro assisted system for rapid plant generation cycle time in lentils, lupins, chickpeas and field peas is developed.	Pulse breeding and pre-breeding programs were provided with the capacity to use accelerated single seed descent (aSSD) technology, in an efficient and cost-effective way, to facilitate rapid delivery of their project outputs. The aSSD technology enables breeding programs to develop six generations of homozygous material in a single year, in contrast to three years in the field or two years with conventional SSD technology.
Germplasm with tolerance to acid soils and diagnostic and gene-specific molecular markers for acid soils tolerance are developed and delivered to Australian barley breeders.	Barley germplasm with improved tolerance to acid soils was identified. The acid-tolerant test lines performed very well compared to commercial benchmark varieties: the best acid-tolerant lines out-yielded Hindmarsh <sup>(D)</sup> by 41% and Commander <sup>(D)</sup> by 25%.  In addition, 14 gene-specific markers associated with aluminium tolerance and two markers associated with low pH tolerance were identified. The germplasm and molecular markers were made available to Australian barley-breeding entities.
Molecular markers for salinity tolerance are developed and delivered to Australian wheat breeders.	Molecular markers linked to salinity tolerance, in particular for mechanisms for sodium exclusion and osmotic tolerance, were identified and are being validated.
A database of genotypes for five key wheat phenology genes for use in assessing the impact of genetic variation on heading date and crop performance is developed and delivered to Australian wheat breeders.	Genetic variation was identified for genes related to flowering, vernalisation and photoperiod. An updated database of genotypes for Australian wheats was provided to Australian wheat breeders.
Field-validated data regarding the phosphorus use efficiency of major Australian wheat cultivars and data regarding genetic control of this trait are provided to Australian wheat breeders.	Some wheat cultivars with differential responses to phosphorus and differences in related root traits were identified among current varieties and elite lines. The results were provided to Australian wheat breeders.
Germplasm and markers for alternative Rht alleles are made available to Australian wheat breeders and barley breeders.	Ten alternative dwarfing genes (Rht1, Rht2, Rht3, Rht5, Rht8, Rht9, Rht10, Rht12, Rht13 and Rht18) were selected and are being further validated in field trials.
A phenotyping method for head loss in barley is developed and genetic variation for this trait is identified.	Head loss is a difficult trait for phenotyping, because trait expression is heavily influenced by environmental conditions and lodging and straw breakage have significant impacts on head loss. However, genetic variation for head loss was confirmed in elite Australian barley germplasm, using biomechanical measurement of straw strength as a surrogate for measuring head loss. Measuring tools and genetic material will be developed for barley-breeding programs.
At least one closely linked marker for a breeder-defined priority trait is delivered to the breeding programs for field peas, chickpeas and faba beans.	Markers for four traits in field peas were implemented in the Pulse Breeding Australia breeding program. Markers for three traits in lentils, two in chickpeas, one in field peas and one in faba beans were delivered to commercial breeding programs.
All Australian wheat breeders are provided with accurate managed environment facility data quantifying the yield potential value of a minimum of six water productivity traits in defined production environments.	Evaluation of traits in managed environment facilities showed marked improvements in yield related to particular traits. Traits such as cooler canopies, greater early vigour, leaf waxiness, and factors contributing to stay-green (particularly leaf-rolling) provided greater productivity compared with traits such as carbon isotope discrimination, water-soluble carbohydrates and reduced tillering, whose benefits were highly contingent on the environment type and/or the genetic background under assessment.



**Table 11: Theme 2 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
All Australian canola breeders are provided with accurate data quantifying the yield potential value of shattering, heat and water productivity traits in defined production environments.	Phenotypic variation for water productivity traits was identified in 144 diverse canola genotypes analysed across five agricultural environments. Over 50 canola lines were identified as being highly tolerant to pod shatter. A total of 104 lines were assessed for heat tolerance; the putative tolerant lines will be tested in 2015. Results were delivered to canola breeders.
More than 20,000 crop variety guides summarising the agronomic performance characteristics (yield, disease and herbicide tolerance) of 10 commercial crops grown within the National Variety Trials system are delivered.	NVT data on yield, disease and herbicide tolerance, along with other variety-specific agronomy information, was communicated to grain growers through more than 34,350 guides, comprising approximately: <ul style="list-style-type: none"> <li>• 7,000 wheat variety guides in Queensland</li> <li>• 6,600 crop variety guides in South Australia</li> <li>• 6,750 crop variety guides in Victoria</li> <li>• 7,000 wheat variety guides and 7,000 barley variety guides in Western Australia.</li> </ul>
Two freely available online/tablet-based applications that assist growers and their advisers to interpret crop variety yield performance and disease rating results are developed and deployed.	Three apps were developed and launched: <ul style="list-style-type: none"> <li>• the Australian Field Crop Disease Guide app, to assist growers and advisers to quickly identify disease resistance ratings for NVT-tested varieties, covering 33 different combinations of crops, diseases and regions</li> <li>• the Long-term Cross-site Analysis app, to assist growers to interrogate the yield potential and stability of crop varieties in their regions</li> <li>• a Microsoft Excel based tool to help growers and agronomists examine the NVT database in greater detail.</li> </ul>

**Table 12: Theme 2 performance against portfolio budget statements measures for 2014–15**

Key performance indicator	Target	Result
New cereal, pulse and oilseed varieties have minimum increases in genetic yield potential per annum as measured in National Variety Trials (NVT).	Cereals 1% Pulses 2% Oilseeds 1.5%	Achieved. NVT testing confirmed that seven new wheat varieties, six new canola varieties and one new faba bean variety demonstrate per annum yield potential increases that exceed the targets.
New varieties currently available meet the expectations of growers.	60%	Achieved. Results of the 2015 Grower Survey showed that the proportion of growers saying that new grain varieties meet their expectations fairly well to very well has continued to trend upwards, increasing by 9% from 70% in 2014 to 76% in 2015.
Growers and advisers use NVT data in selection of varieties to plant.	35% access data, of which 90% consider helpful	Results of the 2014 Grower Survey <sup>a</sup> showed that: <ul style="list-style-type: none"> <li>• NVT Online access has been trending upwards since 2006, and most people using this medium find it easy. Among growers aware of the NVT, 31% accessed the website (this proportion equates to 27% of all growers); and 31% attended a field day (this proportion equates to 28% of all growers).</li> <li>• A very high proportion (95%) of growers who have accessed NVT Online and/or visited an NVT field day say that the information sourced has assisted them to select varieties. This proportion equates to 41% of all growers.</li> </ul>

<sup>a</sup> These performance indicators are included in the GRDC Grower Survey every second year. Data will next be collected in the 2016 Grower Survey.



## What's in the RD&E pipeline for 2015–16?

- A new component of the National Brassica Germplasm Improvement Program that will investigate genetic variation for oil quality and stability—priority traits identified by breeders—and deliver the traits in diverse germplasm to canola-breeding companies.
- Importation of high-yielding spring and durum wheat germplasm with improved genetic resistance to crown rot and root-lesion nematodes.
- Investigation of genetic approaches to improve heat tolerance and reduce the nitrogen dilution effect in wheat.



Plant breeder Jason Able, from the University of Adelaide, is crossing elite, high-yielding varieties of durum wheat with germplasm with reduced susceptibility to crown rot. Photo: Ranjit Das



# Theme 3—Protecting your crop

This theme aims to develop cost-effective control options that prevent pests, weeds and diseases from causing crop yield and quality losses, and increase growers' profit.

Existing control measures for pests, weeds and diseases require ongoing review in light of:

- potential and actual incursions of exotic pests
- changes in regulation of pesticide use and access
- the need to
  - reduce the cost and increase the speed of delivery of resistant and tolerant varieties
  - manage herbicide and pesticide resistance
  - provide ongoing stewardship of gene technology and pesticide products to support long-term access.

The 'Protecting your crop' theme develops the cultural, chemical and genetic options available to manage key pests, weeds and diseases in each region. Management options need to take into account cost-effectiveness, resilience of control strategies and flexibility to fit different farming systems.

The following sections describe some highlights of RD&E investments that addressed this theme in 2014–15.

## Chemical control options

The pest management needs of the Australian grains industry are changing as a result of many factors, including pesticide resistance, regulatory activity, market access issues and registrant indifference with respect to generic pesticides. These effects are increasing pressure on the industry to secure alternative chemical management options.

The GRDC supports projects to facilitate access to necessary herbicide, insecticide and fungicide options generally not available to growers via commercial manufacturers and formulators.

One such project focuses on regulatory approval of minor use chemicals, securing access for growers to suitable pest management solutions not currently covered by chemical registrants.

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Between April 2014 and March 2015, 11 permits were issued as a consequence of the project. The permits covered both minor and emergency use situations in pulses and oilseeds. The products covered included herbicides, pesticides and fungicides, and the crops covered included adzuki beans, field peas, lentils, peanuts, sunflower, faba beans, mungbeans and soybeans.

Another GRDC-supported project focuses on opening pathways to registration for label extensions that allow new uses of chemicals on grain crops. The project is conducting field trials to generate pesticide residue data on pesticide–crop combinations that the grains industry has identified as high priorities. The data will be collated into applications to the Australian Pesticides and Veterinary Medicines Authority (APVMA) for industry-initiated amendments to pesticide product labels to allow certain uses (Item 25 applications).

Two field trials were established in 2014–15, for three herbicides:

- propyzamide, on lentils and lupins
- imazamox and pyroxasulfone, on adzuki beans, mungbeans and soybeans.

One Item 25 application was submitted and is being evaluated by the APVMA.



## Exotic pests

Australia has many biosecurity systems in place, and the Australian grains industry remains free of many pests that cause significant crop losses overseas. However, natural pathways for insects and the movement of large volumes of goods and people leave open the potential for exotic crop pests to enter Australia.

The GRDC supports projects to extend the grains industry's preparedness and chemical management options for possible incursions of exotic pests.

### Preparation and surveillance

A national approach to plant pest preparedness will assist the grains industry to respond to, and recover from, any pest incursion quickly and effectively. The GRDC supports a project that is developing a coordinated strategic approach to surveillance, awareness and management of pest incursions.

The project has developed contingency plans for exotic nematodes, soil-borne pathogens, necrotrophic pathogens and insect-transmitted viruses, and plans for exotic sucking and chewing insect pests are under development. A review of pesticide control options for 41 priority pests has been finalised.

The threat summary tables in the *Grains Industry Biosecurity Plan* have been reviewed and expanded, to cover a total of 611 exotic pest species, including 54 high-priority pests. The final version of the plan has been endorsed by industry, through Grain Producers Australia, and all Australian government jurisdictions, through the Plant Health Committee.

In collaboration with Plant Health Australia, the project has developed materials to promote biosecurity training and awareness, and reached agreement on competencies and assessment for training in the detection and reporting of exotic pests in the grains industry.

The project has also drafted a chemical supply framework describing where and how additional data could improve pest forecasting and mitigate risks to chemical supply.

## Permits for emergency use

A GRDC-supported project is reviewing gaps in the grains industry's preparedness to manage future incursions of high-priority exotic plant pests, identifying pesticides for use in response to such incursions, and preparing appropriate submissions for emergency use permit applications to the APVMA.

To date, the project has identified chemical control options for 56 exotic pests. In many cases, a single active chemical constituent could be used to manage multiple pests. Applications have been prepared for the use of lambda-cyhalothrin and deltamethrin, which should result in permits for the control of eight exotic pests.

The project has also identified potential gaps in contingency planning; identified new technologies that could be used to control 15 pests; and considered the regulatory threats associated with the use of certain chemicals for the control of 48 pests. This information will be considered when preparing future applications to the APVMA.

## Snails and slugs

Exotic snail and slug species are widespread throughout the most productive cropping areas of southern and western Australia. They can cause significant yield losses, and reduce profitability through the costs of harvester repair and grain cleaning, as well as downgrading or rejection of grain at receipt.

The GRDC supports research to improve understanding of the effective management of snail and slug pest species and provide recommendations to growers.

The project has updated the Australian distribution records of the most common pest species—the black-keeled slug, common white snail and small pointed snail—and modelled the potential distribution and environmental correlates of each species.

Through field and laboratory experiments, the project has tested the effectiveness of a range of bait products and practices for controlling juvenile and adult snails and slugs. Findings in 2014 included:

- To be effective, baits need to be evenly distributed at a density of 50–60 pellets per square metre. Achieving this density may require label changes for some registered products.



- Bait persistence depends on environmental conditions: rainfall breaks down bran-based products and degrades iron chelate products, while ultraviolet light degrades metaldehyde.
- Placing bait with seed, rather than broadcasting bait, does not improve plant establishment.
- The impact of cover crops and crop rotations needs further investigation. In laboratory tests, the rate of population growth of grey field slugs was lowest on linseed and beans and highest on wheat and canola.

A survey of growers revealed that information about current options to manage snails needs to be communicated more effectively, particularly in areas where the pests are newly arrived. Work also needs to be done to refine existing methods and evidence-based recommendations for their use. Specific areas for improvement include: stripper fronts and fixed aperture sieves for harvesters; stubble height and rolling management; grain-cleaning rollers; and windrow burning.

## Beet western yellows virus

Beet western yellows virus, spread by green peach aphid, caused significant losses in canola crops across south-eastern Australia in 2014. In 2014–15, the GRDC invested in a project to analyse the outbreak and develop recommendations to help canola growers limit future infections.

The project examined the timing, distribution and levels of infection in canola crops; the presence of the disease in weeds and pulse crops; and the specific virus involved. It also surveyed canola growers, to understand how crop management practices affected the severity of infection and its effect on grain yield.

The following recommendations were communicated to growers ahead of the 2015 season:

- Weed control should start in summer or early autumn, at least four weeks before canola is sown, to reduce aphid numbers. Ideally weed management should occur both within and outside paddocks.
- Stubble should be retained to reduce aphid landings.

- In seasons or regions of high risk
  - canola crops should not be sown earlier than normal, but should be sown at higher density, using more vigorous varieties, to quickly cover the ground
  - neonicotinoid seed dressing should be used on canola seed.
- Growers should check for aphids before the crop reaches the rosette stage, to determine whether foliar insecticide is needed.

The project also concluded that researchers and agronomists should monitor aphid populations (and possibly virus infection in weeds and forage brassica crops) during the pre-sowing period each season, to determine risk.



Green peach aphid, the main vector for beet western yellows virus, is widespread across all grain-growing regions and has high levels of resistance to common insecticides. Photo: GRDC



## Cereal diseases

### Crown rot

Crown rot is a chronic fungal disease that causes severe yield loss in wheat and barley, in Australia and many other parts of the world. Crown rot can also cause infected plants to produce mycotoxins, which are a safety concern in food or feed grain.

Barley is more tolerant of crown rot than wheat is, and accumulates high concentrations of the crown rot pathogen. Developing resistant barley varieties could not only reduce damage in a barley crop, but also significantly reduce the amount of pathogens available to inoculate subsequent cereal crops.

Previous research has identified barley genotypes with high levels of crown rot resistance. A GRDC-supported project is further examining those genotypes, to identify the genetic sources of the resistance and transfer them into locally adapted cultivars for use by Australian barley breeders.

The research has identified QTL conferring crown rot resistance in barley from two novel sources of resistance, and demonstrated that combining resistance genes from different sources is very effective in enhancing resistance. Lines drawing on one or other of the resistance sources, and lines combining resistance genes from both sources, have been provided to barley breeders.

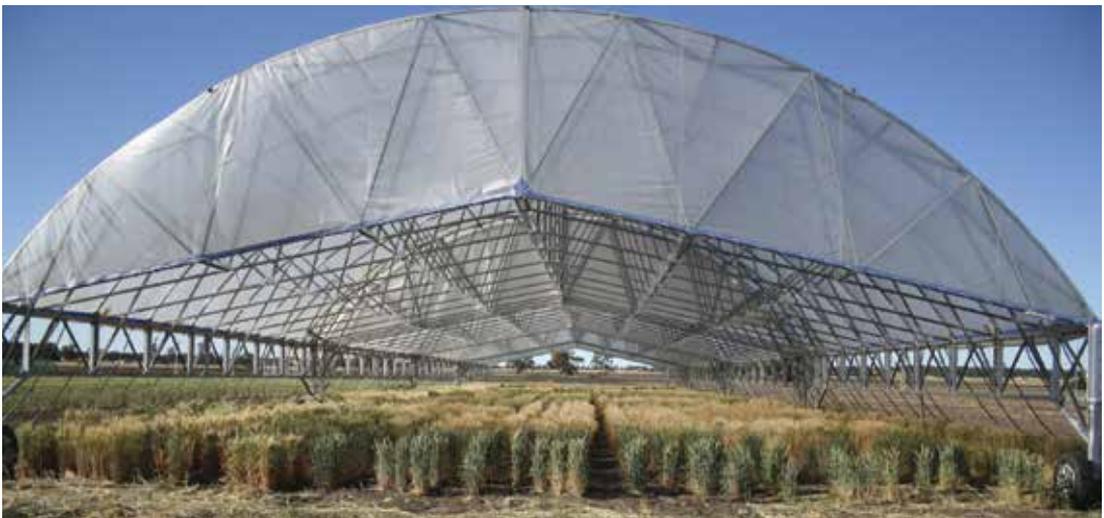
### Rusts

Leaf or brown rust and yellow or stripe rust are two important diseases of wheat in Australia and worldwide. The Ug99 variants of the stem rust pathogen pose a global menace to wheat production.

With support from the GRDC, the Australian Cereal Rust Control Program is working with the International Maize and Wheat Improvement Center (CIMMYT) to develop cereal cultivars that are resistant to these three diseases, to reduce crop losses, enhance profitability and protect the environment.

Through this collaboration in 2014–15, phenotyping conducted in Kenya identified Australian wheat lines with moderate to good levels of resistance against a Ug99 race group of the stem rust pathogen. A small proportion of Australian barley varieties and breeding materials was found to be resistant to race 24 of the barley yellow rust pathogen. Similarly, phenotyping of Australian wheat varieties in Mexico identified lines with resistance to prevalent races of leaf rust and yellow rust.

A set of 311 wheat materials developed in Mexico, which combine high-value traits such as high yield and high end use quality with durable adult plant resistance to rusts, were selected and provided to Australian wheat-breeding programs for phenotyping in Australian environments and use in variety development.



A large rainout shelter enables researchers to screen cereal varieties for resistance to crown rot under conditions of moisture stress, at the University of Sydney's Plant Breeding Institute at Narrabri, New South Wales. Photo: GRDC



# CASE STUDY: HARVEST WEED SEED CONTROL

Supported by the GRDC, the Australian Herbicide Resistance Initiative (AHRI) works with the agricultural industry to achieve sustainable weed management in the face of emerging weed spread and herbicide resistance challenges. This includes providing grain growers with a suite of herbicide and non-herbicide options to be integrated into weed management strategies tailored for their farming systems.

Harvest weed seed control is an essential element of sustainable weed management in Australian cropping. Any viable seed left in the weed seed bank is a potential threat to the next crop, and many weed seeds that contaminate grain at harvest are from populations that are developing resistance to commonly used herbicides.

AHRI research has shown that the four dominant weeds of Australian crops—annual ryegrass, brome grass, wild oats and wild radish—retain 77 percent to 95 percent of their seeds above a harvest cut height of 15 centimetres at wheat crop maturity. This provides significant opportunities to interrupt the potential of these plants to replenish the weed seed bank at harvest.

Harvest weed seed control is a major focus of AHRI's RD&E. The initiative has assessed and provided information for growers on a range of techniques and equipment, such as narrow windrow burning, chaff carts, the Bale Direct System and the Harrington Seed Destructor. Future research will look at new ideas such as windrow rotting and chaff decks.

Harvest weed seed control techniques are now routinely employed in the Western Australian grain belt. In August 2014, AHRI facilitated an opportunity for Western Australian farmers with high expertise in harvest weed seed control techniques to travel to Canada and the United States and share their experiences.



*Bromus diandrus* and *B. rigidus*, the two main problem species of brome grass, are major crop weeds in southern Australia and are developing herbicide resistance. Photo: Dodgshun Medlin Agricultural Management

Adoption of harvest weed seed control techniques has been slower in eastern Australia. In response, AHRI has expanded its efforts to deliver the latest information on harvest weed seed R&D to New South Wales, Queensland, South Australia and Victoria, through webinars, workshops and online news services. In 2014, subscriptions to the AHRI insight blog ([ahri.uwa.edu.au/news](http://ahri.uwa.edu.au/news)) increased by 64 percent.

AHRI also provides information for growers through a range of publications, including media releases, articles in agricultural journals and grower group newsletters, as well as GRDC updates around the country. The research behind these extension activities is also available: 21 articles were published in quality international research journals in 2014.



**Table 13: Theme 3 performance against GRDC strategic measures**

<b>Theme 3—Protecting your crop</b>	
<b>Aspirational outcome (10+ years)</b>	<i>Australian grain growers managing their farms to maximise profit and reduce risk by adopting effective, sustainable and efficient control of weeds, pests and diseases.</i>
<b>Intermediate outcomes (5 years)</b>	
<b>Effective, sustainable and efficient management of weeds</b>	Growers use a combination of new genetic, biological, cultural and chemical weed management tools to reduce crop losses and minimise control costs.
<b>Effective, sustainable and efficient management of vertebrate and invertebrate pests</b>	Growers use a combination of new genetic, biological, cultural and chemical tools to reduce crop losses and minimise control costs of vertebrate and invertebrate pests.
<b>Effective, sustainable and efficient management of cereal rusts</b>	Growers use a combination of new genetic, cultural and fungicide management tools to reduce crop losses and minimise control costs of cereal rusts.
<b>Effective, sustainable and efficient management of cereal (non-rust), pulse and oilseed fungal pathogens</b>	Growers use a combination of new genetic, cultural and fungicide management tools to control cereal (non-rust), pulse and oilseed root and foliar fungal diseases.
<b>Effective, sustainable and efficient management of nematodes</b>	New genetic, biological and cultural management tools for the control of nematodes are delivered.
<b>Effective, sustainable and efficient management of viruses and bacteria</b>	Growers use a combination of new genetic and cultural management tools for the control of viruses and bacteria.
<b>Biosecurity and pesticide stewardship</b>	Effective biosecurity and science-based support is available for pesticide and genetic technology stewardship.
<b>Expenditure for 2014–15</b>	\$49.33 million

<b>Performance for 2014–15</b>	
<p><b>Effective, sustainable and efficient management of weeds</b></p> <p><b>Effective, sustainable and efficient management of vertebrate and invertebrate pests</b></p> <p><b>Effective, sustainable and efficient management of cereal rusts</b></p> <p><b>Effective, sustainable and efficient management of cereal (non-rust), pulse and oilseed fungal pathogens</b></p> <p><b>Effective, sustainable and efficient management of nematodes</b></p> <p><b>Effective, sustainable and efficient management of viruses and bacteria</b></p> <p><b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>• A greater proportion of growers and their advisers monitor crops for pests, weeds and diseases.</li> <li>• Breeders and pre-breeders use available genetic diversity for resistance and tolerance breeding.</li> <li>• Growers and their advisers cost-effectively manage pests, weeds and diseases.</li> <li>• A greater proportion of growers and their advisers use practices to increase pesticide longevity and reduce the risk of resistance.                             <ul style="list-style-type: none"> <li>– <i>More than 70% of growers are aware of integrated weed, pest or disease management practices, and 50% use some form of integrated management methods on their farm.</i></li> </ul> </li> </ul>	



**Table 13: Theme 3 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
<p>New and cost-effective control methods for weeds, pests and diseases, including new chemistries and non-chemical control tactics, are delivered to the grains industry.</p>	<p>The Herbicide Innovation Partnership, a collaboration between the GRDC and Bayer CropScience, was announced. The collaboration will develop innovative weed management solutions and provide growers with new technologies to manage resistant weeds and support the sustainability of modern crop production systems.</p> <p>The GRDC released <i>Soil Behaviour of Pre-Emergent Herbicides in Australian Farming Systems: A Reference Manual for Agronomic Advisers</i>.</p> <p>Data packages for 15 new use patterns for the grains industry commenced. Data packages were submitted (in conjunction with chemical companies) for registration of insecticides, fungicides and herbicides for the control of silver leaf whitefly in navy bean; aphids and sucking pests in pulse crops; aphids in canola; powdery mildew in barley; and weeds in pulse crops and fallow.</p> <p>A workshop on potential genetic technologies for future weed control was held in Canberra, covering topics such as RNAi (ribonucleic acid inhibition) technologies, next-generation sequencing, competitive crops, and commercial considerations.</p> <p>Information on the advantages of using an east to west crop orientation to reduce annual ryegrass fecundity and increase crop yield was disseminated through journal articles, conference papers and media releases and articles.</p>
<p>Regionally validated information about the benefits (both financial benefits and benefits from avoidance of resistance to chemicals) of integrated methods for control of weeds, pests and diseases is readily available to growers and advisers.</p>	<p>A pesticide resistance management plan for green peach aphid was released by the GRDC Grains Pest Advisory Committee.</p> <p>An industry-based information campaign in response to the 2014 outbreak of beet western yellows virus effectively provided growers with updated information on green peach aphid resistance to current insecticides, and management options for infected and non-infected canola and pulse crops.</p> <p>Information on the herbicide resistance status of barley grass, brome grass, ryegrass, wild oats and wild radish across Western Australia was published, and made available through GRDC updates and the Australian Herbicide Resistance Initiative (AHRI) website.</p> <p>Herbicide resistance surveys for eastern Australia were established and will be conducted at five-year intervals in each agroecological region.</p> <p>Research by AHRI demonstrated that cross-resistance to both pyroxasulfone and prosulfocarb can evolve from selection with pyroxasulfone or prosulfocarb only; this information is being incorporated into resistance surveys and information for growers.</p>
<p>Increased number of growers are adopting integrated control methods.</p>	<p>An updated manual on integrated weed management was released and made available on the GRDC website.</p> <p>Results of the 2014 Grower Survey<sup>a</sup> showed improvements in the proportion of growers who changed practices directly or indirectly as a result of GRDC information, activities or supported projects in relation to protecting crops from:</p> <ul style="list-style-type: none"> <li>• weeds—increased to 58% from 57% in 2012</li> <li>• pests—increased to 49% from 48%</li> <li>• diseases—increased to 60% from 59%.</li> </ul> <p>Harvest weed seed control is being adopted by an increasing proportion of growers across Australia, including more than 60% of growers in the northern Western Australian wheat belt.</p>



**Table 13: Theme 3 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
<p>Growers have the skills to monitor crops and correctly identify weeds, pests and diseases, as well as beneficial organisms; determine whether or not control is warranted; and select the most suitable control method when required.</p>	<p>The GRDC supported the extension of integrated weed management information to growers through workshops, webinars and YouTube videos.</p> <p>The GRDC published fact sheets on wild radish management; pre-emergent herbicides; Group A herbicide use in fallow; and pre-harvest herbicide use.</p> <p>With GRDC support:</p> <ul style="list-style-type: none"> <li>• A national census of mouse activity was conducted, providing farmers, the grains industry and researchers with an unprecedented bank of data about mouse activity in agricultural areas.</li> <li>• Stop the Spot, a nationwide campaign engaging growers in the fight to reduce yellow spot disease, was launched. The first season's results confirmed that yellow spot infection is widespread across Australia.</li> <li>• Through the Mildew Mania citizen science project, record high numbers of school students collected samples of diseases such as powdery mildew in barley, ascochyta blight in pulses and blackleg in canola, including fungicide-resistant populations. Results were used to provide warnings and advice to growers prior to sowing.</li> <li>• The Australian Field Crop Disease Guide smartphone app was released, providing quick access to current disease resistance ratings, disease information and an extensive library of disease-related images.</li> </ul>
<p>Breeding programs efficiently use the available genetic diversity to improve varietal resistance to weeds, pests and diseases.</p>	<p>Preliminary research by the GRDC-supported Centre for Crop and Disease Management (CCDM) demonstrated that varietal resistance to yellow leaf spot was more economical than fungicide treatment under low to moderate disease pressure in wheat. The CCDM also identified novel genetic sources of resistance to <i>Septoria nodorum</i> blotch in wheat.</p> <p>Mexican durum and spring wheat lines from the International Maize and Wheat Improvement Center (CIMMYT) were screened for resistance to root-lesion nematodes and crown rot, and new sources of resistance were integrated into wheat lines nominated by Australian breeders.</p> <p>Through a GRDC-supported project, chickpea lines were screened for tolerance to clopyralid and imazapyr herbicides, and successful lines were crossed with elite lines from Pulse Breeding Australia. From the resulting lines 15 desi chickpea and two kabuli chickpea lines are undergoing multiplication.</p> <p>Other work on herbicide tolerance in pulses included:</p> <ul style="list-style-type: none"> <li>• screening lentils for tolerance to carfentrazone-ethyl, dicamba and isoxaflutole</li> <li>• stacking of metribuzin and MCPA traits in lentils</li> <li>• screening faba beans for tolerance to dicamba, imidazolinone, and metribuzin.</li> </ul>
<p>Growers reduce their planting of varieties known to be susceptible to pests and diseases, including to disease vectors.</p>	<p>Pest and disease resistance ratings for varieties were updated, and information was provided to growers through the National Variety Trials website, fact sheets and guides.</p>
<p>Periodic compilations of industry data demonstrate that cost savings are being achieved in the control of weeds, pests and diseases, and the GRDC and other industry participants use these compilations to guide investment decisions.</p>	<p>The recommendations of a review of the GRDC's strategic investment in weeds research, development and extension were implemented in projects and investment decisions for 2015–16, including greater involvement and liaison with Grower Solutions Groups and Regional Cropping Solutions networks.</p>



**Table 13: Theme 3 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
<p><b>Biosecurity and pesticide stewardship</b></p> <p><b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>• A greater proportion of growers and their advisers use surveillance and biosecurity measures to manage and prepare for incursion and containment of exotic plant pests, plants and diseases.               <ul style="list-style-type: none"> <li>– At least 50% of growers undertake on-farm practices to maintain or improve their biosecurity.</li> </ul> </li> <li>• Breeders and pre-breeders use available genetic diversity to deliver varieties resistant to high-risk biosecurity threats.</li> <li>• A greater proportion of growers and their advisers manage stewardship of pesticides and varieties to prolong pesticide effectiveness and ensure safety to health and the environment.               <ul style="list-style-type: none"> <li>– 90% of growers undertake activities to delay the onset of or manage herbicide resistance in weed populations.</li> </ul> </li> </ul>	
Targets	Achievements
<p>Growers are aware of assessments of biosecurity threats to the grains industry, adopt on-farm biosecurity measures, and know what to do in the event of an incursion.</p>	<p>A review and audit of pesticide control options for 41 priority exotic pests was finalised, and an extensive desktop review of pesticide control options used overseas was presented for each pest.</p> <p>The grains industry threat summary tables have been expanded significantly since the most recent version of the Grains Industry Biosecurity Plan was released (2009). Exotic pest threats have been identified for all 25 crops subject to the GRDC levy, and threat summaries have been generated for 611 exotic pest species, including 54 high-priority pests that are considered significant risks to the grains industry.</p>
<p>Pre-breeding programs are developing germplasm with a high resistance to identified high-risk biosecurity threats.</p>	<p>Through a collaboration between the Australian Cereal Rust Control Program and CIMMYT, 1,512 wheat lines were phenotyped for resistance to the Ug99 race group of stem rust in Kenya.</p> <p>Molecular analysis showed that 80 elite Australian wheats, including varieties from the Northern, Southern and Western regions, are uniformly susceptible to Karnal bunt, Hessian fly and Sunn pest; the findings are being verified through phenotypic testing. Elite Australian varieties nominated by breeders were crossed with overseas varieties with resistance to Karnal bunt and Hessian fly, and several genetic variations for resistance to Hessian fly were identified.</p>
<p>Growers and advisers have access to and use information on chemical management and plant varieties so that appropriate tactics can be implemented to manage weeds, diseases and insects; delay onset of resistance; ensure safety to health and the environment; and not adversely affect trade.</p>	<p>Grain Producers Australia released the guide <i>Growing Australian Grain: Safely managing risks with crop inputs and grain on farm</i>. The technical development of the guide was funded by the GRDC.</p> <p>Overall compliance with the National Residue Survey maximum residue level for export grain was 99.9% for bulk grain and 98.8% for container exports.</p> <p>A GRDC-supported pilot project was able to detect and continuously monitor critical variations in surface temperature inversions, with the capability to deliver real-time advice for chemical spray application along the lines of the GOspray smartphone app.</p>

<sup>a</sup> These performance indicators are included in the GRDC Grower Survey every second year. Data will next be collected in the 2016 Grower Survey.



**Table 14: Theme 3 performance against portfolio budget statements measures for 2014–15**

Key performance indicator	Target	Result
Growers and advisers are aware of and use integrated weed, pest or disease management practices.	70% aware, 50% use	Achieved. Results of the 2014 Grower Survey <sup>a</sup> showed that: <ul style="list-style-type: none"> <li>• 74% of growers were aware of integrated weed management practices, and 82% of growers used such practices</li> <li>• 70% of growers were aware of integrated pest management practices, and 61% of growers used such practices</li> <li>• 61% of growers were aware of integrated disease management practices, and 63% of growers used such practices.</li> </ul>
Growers undertake on-farm practices to maintain or improve their biosecurity.	30%	Achieved. Results of the 2014 Grower Survey <sup>a</sup> showed that: <ul style="list-style-type: none"> <li>• 53% of growers had undertaken on-farm practices to maintain or improve their biosecurity</li> <li>• 93% of growers were practising on-farm hygiene to reduce the spread of weeds, pests or diseases.</li> </ul>

<sup>a</sup> These performance indicators are included in the GRDC Grower Survey every second year. Data will next be collected in the 2016 Grower Survey.

## What's in the RD&E pipeline for 2015–16?

- Delivery of a package of new cereal phenotypes with traits associated with crown rot resistance and tolerance and the expression of white heads and stem browning, through the Crown Rot Initiative.
- A national canola pathology program to monitor all diseases of canola and provide information to growers on managing disease and the risk of yield loss, with a focus on blackleg disease.
- A national approach to develop improved strategies for minimising losses associated with root-lesion nematodes, including work to determine the yield losses caused by certain nematode species and the effects of rotational crops on nematode densities.
- Research to generate new knowledge about the life cycles and biology of a range of pest and beneficial invertebrate species across the Southern and Western regions, to assist growers and advisers to make informed decisions about proactive pest control.
- Research to generate new knowledge about weed seed dormancy behaviour and the longevity of the most important cropping weeds in each region, to assist growers and advisers to make informed decisions about crop protection practices to manage emerging weeds.



This canola seedling has been inoculated with blackleg spores as part of a project investigating how the fungus attacks the canola plant's resistance genes.  
Photo: Steve Marcroft



# Theme 4—Advancing profitable farming systems

This theme aims to provide growers and their advisers with the tools to design and manage a farming system with the flexibility to adapt and respond; manage risk; and generate profit.

The ‘Advancing profitable farming systems’ theme will:

- ensure that research results from the other themes are integrated on farm
- undertake production agronomy research for systems development
- provide an important conduit for identifying on-farm production constraints and opportunities to inform activities in other themes.

The investment strategies for this theme will differ across agroecological zones and farming systems, and will be a combination of:

- applied farming systems research to overcome major, widespread regional constraints
- short-term development and extension activities to improve technologies or practices for a target group of growers in an agroecological zone.

The following sections describe some highlights of RD&E investments that addressed this theme in 2014–15.

## Frost

Frost is one of the most significant risk factors in Australian cereal production, particularly in the Southern and Western regions. To provide growers with accurate, up-to-date information on how their crop management systems can best reduce that risk, the GRDC is supporting research to assess the impact of management practices and products on the frost susceptibility of wheat crops.

Of the eight practices evaluated in 2014—stubble management, stubble load, grazing, soil amelioration, canopy management, crop architecture, copper application, and directional sowing—most were found to affect the impact of frost events.

Retained stubble was shown to increase the severity and duration of frost events. At sites where frost coincided with flowering but frost damage

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was not complete, reducing stubble led to yield gain of up to 500 kilograms per hectare.

However, this effect occurs only above certain stubble loads, in proportion to the production level of the environment: higher stubble loads are required to increase frost risk in higher production environments. Standard stubble reduction practices—such as mulching, cutting low and windrow burning—are likely to be able to reduce frost risk to an acceptable level while maintaining benefits of stubble retention, such as increased rainfall infiltration.

Shifting the crop’s flowering time, through strategic grazing, was shown to reduce frost severity and duration. The number of days to flowering was increased by roughly half the number of days grazed. The ability to alter flowering time by using plant growth regulators was also confirmed.

Soil amelioration practices can increase or decrease frost severity and duration, depending on the changes they make to the soil surface. Bringing up gravel or reducing soil’s non-wetting properties reduced frost effects, while bringing up whiter subsoil increased them.

Thinning the canopy, through lower seeding rates or more conservative application of fertiliser or nitrogen, reduced frost damage, but results for skip row seeding were mixed. Applying copper to the test site soils, which were not copper deficient, did not affect frost damage.



Five registered chemical products and 17 experimental chemical products were trialled in 2014, to evaluate their ability to reduce reproductive frost damage. Two registered products (with the same active ingredient) reduced frost-induced sterility, but did not increase grain yield, while none of the experimental products reduced frost damage.

These preliminary results will be analysed further as the trials continue. By 2016, the project will deliver sound, field-based data to growers and advisers, to support improved agronomic management of frost risk.

## Water-repellent soils

Soil water repellence significantly reduces crop and pasture productivity, typically resulting in very inefficient use of soil water and nutrients, poor weed control and increased risk of wind erosion.

Nearly 3.3 million hectares of Western Australia's agricultural soils are either affected by or at high risk of soil water repellence, and a further 6.9 million hectares are at moderate risk. Information collected through Regional Cropping Solutions and other GRDC engagement with Western Australian growers indicates that most growers believe water repellence is increasing, and rate it as one of the biggest constraints to their productivity.

Previous GRDC investment in water repellence research has delivered a range of management options to growers. Commencing in 2014–15, the GRDC is supporting a project to enhance and refine those management options, with a particular focus on developing the options best suited to a range of affected Western Australian soil types.

The project will combine four approaches:

- understanding the nature and causes of water repellence
- improving short-term mitigation strategies, by researching practices such as modified sowing techniques and products such as banded soil wetters and polymers
- improving medium- and long-term amelioration strategies, by investigating practices such as one-off soil inversion, one-off deep tillage, and clay spreading or delving
- identifying new options for managing soil water repellence.

Management options for water repellence are being considered in the context of other management issues, such as herbicide resistance, pests and diseases, crop nutrition, soil organic matter, soil water availability, and wind erosion.

Extension of research outputs will be an important component of the project, delivered in collaboration with key grower groups and agribusiness and consultant networks. As well as helping to ensure that the project delivers relevant information, this approach will give growers and advisers confidence in choosing the management options best suited to their particular soil types and circumstances.

As an additional benefit, the project will strengthen soils research capacity in Western Australia. Two graduate students will be appointed as research officers, and three PhD students and a postdoctoral fellow will receive funding for their research. These students will have a valuable opportunity to interact with key providers in the grains industry, while learning from highly experienced soil researchers from CSIRO, Murdoch University and the Department of Agriculture and Food, Western Australia.

## Root-lesion nematodes

Root-lesion nematodes—*Pratylenchus thornei* and *P. neglectus*—are widespread in cropping areas of the Northern Region. In susceptible wheat varieties, they can reduce crop yields by as much as 65 percent. The GRDC supports research to provide evidence-based management strategies to assist growers in the region to control the impact of root-lesion nematodes on crop production.

One such project, based in Queensland, concluded in 2014–15. By linking leading new research on the nature of nematodes with computer modelling, the project examined crop and nematode interactions in farming systems and tested management approaches designed to prevent yield loss.

Previously, it was believed that root-lesion nematodes restricted the plant's ability to take up water by stunting the growth of roots, preventing them from reaching water deep in the soil. The new research found that nematodes do not reduce the amount of root—rather, they hollow out the cortex of the root, reducing its ability to transport water and nutrients. This knowledge was used to build more accurate models of interactions between nematodes and soil moisture in particular wheat varieties.



The project also developed a simple model of the life cycle of *P. thornei*, which showed how soil temperatures influence the rate of increase of nematode populations. This information can be used in calculating the potential advantages of early planting of wheat varieties.

While confirming that variety choice can have a significant impact on crop yield on nematode-infected soils within the current season, the project also demonstrated how crop sequences affect the nematode population from season to season. Although tolerant wheat varieties are less susceptible to yield loss, they provide a host for nematode reproduction, allowing populations to continually increase.

Based on field trials and historical data, the research found that the rate of decline of nematode populations is slow, even during fallow periods. More than a single break crop or long fallow is needed to reduce large populations to below damaging levels: it could be necessary to include resistant crops with a break in excess of 18 months.

Results from the project, including detailed reviews on how temperature, population density, planting conditions and nutrition affect *P. thornei*, have been published in Australia and overseas. Such information was also combined with local experiences to develop management strategies that have been communicated to growers and advisers through fact sheets, *Ground Cover* articles and GRDC updates. Close collaboration with grower groups, particularly through the Northern Grower Alliance, has helped to deliver results to growers quickly and effectively.

## The yield gap

Of the three Australian grain-growing regions, the Northern Region experiences the greatest gap between water-limited potential yields and actual yields for cereal crops. For wheat crops, in recent years the average gap has been 1.9 tonnes per hectare.

The GRDC has invested in a project to examine the role of key agronomic factors in closing the yield gap for wheat and sorghum. The project will assist growers and their advisers to set appropriate yield targets for their soil types and preferred varieties, and identify the best management practices to achieve those targets.

The project is based in New South Wales, with trial sites in the central west and the north. Through a combination of historical statistics and information obtained directly from growers and advisers, the program has established baseline data on the yields achieved, and growers' expectations of their crops, in each area.

Field trials are being conducted to help determine the potential yields for selected varieties, and to examine how agronomic factors interact and contribute to actual yields. Six key agronomic drivers have been identified: time of sowing, hybrid selection, row spacing, plant population, and nitrogen and phosphorus management. A complex series of interactions has been investigated at each of the research sites, with up to 30 treatment combinations focusing on the main drivers for each crop.

Results from 2014 indicate that sowing time is the biggest agronomic driver for wheat production, with early sown crops achieving significantly higher yields in both the north and the west, for all varieties. Variety selection also has a big impact: in one northern trial, yields differed between varieties by as much as 3.0 tonnes per hectare. Variety selection also significantly affected the outcomes of other practices, such as increasing nitrogen or increasing the density of the plant population.

For sorghum, the results from 2014 demonstrate that the largest yield gains can be made by varying nitrogen management. In one set of trials, under both dryland and irrigated conditions, yield increases of 2.0 tonnes per hectare were achieved by adding nitrogen. Early sowing and denser plant populations also showed yield benefits.

These early results will be explored further as the trials continue, and successful strategies for closing the yield gap will be documented and extended to growers and advisers. So far, findings from the project have been communicated to more than 500 growers and advisers across New South Wales, through publications, field days and GRDC updates.



# CASE STUDY: YIELD GAP AUSTRALIA

Closing the gap between the potential and actual yields of Australian cropping land is vital, both to the grains industry's sustainability and profitability, and to the future food security of Australia and the world.

While Australian wheat growers on average achieve just over half their potential yields, the most productive growers consistently achieve 80 percent of potential. Closing that gap for all growers would represent an annual improvement of 0.98 tonnes per hectare, or more than 13 million tonnes in total, averaged across all wheat-growing areas.

The GRDC has invested in the development of the Yield Gap Australia website ([www.yieldgapaustralia.com.au](http://www.yieldgapaustralia.com.au)) to help:

- growers and advisers to benchmark individual farm yields against their water-limited potential and local average yields on the same soil types
- researchers to uncover the causes of yield gaps and identify locations where new technologies or management practices have greatest potential to close the gaps
- R&D investors and policy makers to focus on sustainably improving productivity in the locations with the largest unexploited yield gaps and greatest potential to close them.

Yield Gap Australia features an interactive map-based tool that shows the extent and geographic distribution of the gaps between average yields currently achieved and yields that can be achieved by using the best adapted varieties and crop and land management practices. The maps can display yields at the scale of 297 statistical local areas, 14 agroecological zones or the three GRDC grain-growing regions. Users may choose to look at values for particular years or the average values over 15 years.

As well as a visual overview, the website provides detailed descriptions of the yield gaps, including how they vary under different seasonal conditions. The 'Compare my farm' tool enables users to benchmark particular farms and soil types against local average and potential yields.



A sample image from the Southern Region demonstrates the detailed interactive maps accessible through the Yield Gap Australia website. Photo: Yield Gap Australia website

The datasets underpinning the website were developed by CSIRO and combine extensive recorded data with results derived from world-class modelling tools such as the Agricultural Production Systems sIMulator. They take into account specific information on weather, soil, crop management and variety selection for each area.

Feedback was obtained from growers and GRDC advisory panel members during the website's development, and a system to capture user feedback has been implemented to guide future improvements. These will include expanding the website to cover other crops—data for canola will be added in August 2015.



**Table 15: Theme 4 performance against GRDC strategic measures**

Theme 4—Advancing profitable farming systems	
<b>Aspirational outcome (10+ years)</b>	<i>Australian grain growers managing farming systems that are able to respond and adapt to changing environmental and market conditions to reduce risk and deliver an increase in profitability.</i>
<b>Intermediate outcomes (5 years)</b>	
<b>Knowing what is important (key business drivers)</b>	Identification and understanding of the opportunities, risks and potential impacts of key farming practices in each agroecological zone is improved.
<b>Planning strategically (building system benefits and rotations)</b>	Growers adopt integrated management of opportunities and constraints to increase profit and minimise risk across seasons (above the five-year rolling average).
<b>Responding tactically (individual crop agronomy)</b>	Gross margin generated from the major crops in each agroecological zone is increased.
<b>Expenditure for 2014–15</b>	\$36.12 million

### Performance for 2014–15

#### Knowing what is important (key business drivers)

##### Practice changes and key metrics

- Information is available in each GRDC agroecological zone about the main opportunities, constraints, and risks to farming systems.
  - *The GRDC receives information at least annually via the regional panels.*
- Data is also available in each zone about how whole-farm and farming system decisions affect those opportunities, constraints and risks.
- Better methods and tools are developed for comparison and ranking of the impacts of opportunities and risks on farm profit and sustainability, both short- and long-term.
- A greater proportion of growers and their advisers use information and tools to identify and rank constraints and opportunities to increase profit.
  - *70% of growers place a high importance on the use of decision tools to assist them with strategic or tactical decision making.*

#### Targets

#### Achievements

Growers are able to quantify the gaps between potential and actual yield for wheat at the statistical local area scale and for different decile years.	The Yield Gap Australia interactive website was developed to quantify the difference between actual and potential rain-fed wheat yields across the nation.
A framework which defines attainable yield for three agroecological areas is developed for the Northern Region.	The yield gap was determined for 13 localities across the Northern Region, by comparing estimated attainable yields with data on average yields from the Australian Bureau of Statistics. Eight workshops were conducted, assisting farmers and advisers to review attainable yield data and the most promising ways to improve crop yields. Feedback will assist the development of a series of eight workshops to be held in 2015–16.
Soil moisture measurement information, including estimation methods and system design conceptualisation, is conveyed at major regional forums.	As part of a project developing a new tool to measure and monitor soil moisture, a review of soil moisture measurement and estimation methods was completed.  Reference groups of growers and advisers guided the development of the tool, and regional forums were held to expand awareness of soil measurement information.
Data revealing how whole-farm and farming system decisions affect opportunities, constraints and risks is available.	As part of GRDC-supported work to integrate technical data and profit drivers to assist growers to make more informed decisions, a report on key profit drivers for each agroecological zone was published, drawing on analysis of more than 300 benchmarking datasets and surveys of growers across each region.
A soil moisture prediction tool is developed for growers, using smartphone apps.	A prototype smartphone app was released. By 30 June 2015, 180 users had tested the app and 50 had provided feedback.



**Table 15: Theme 4 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
Key issues and information gaps identified during updates are analysed.	Regional Cropping Solutions networks provided a link between the GRDC, research, development and extension (RD&E) providers, and networks of regionally based growers and agronomists that are able to provide intelligence and experience that can improve the adoption of project outcomes.
Data showing the changes in profit, cash receipts, input costs and other financial indicators being achieved by growers who have adopted the strategic and tactical optimisation of their farming systems is available.	A web database application was developed to provide data collection and secure storage and generate farm business performance analyses.
<p><b>Planning strategically (building system benefits and rotations)</b></p> <p><b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>• A greater proportion of growers and their advisers are aware of the actual and potential impacts of their management on their farming systems across seasons and across the farm, based on regionally validated data as well as their own records.</li> <li>• Growers implement long-term, strategic plans to take advantage of identified opportunities, manage constraints and reduce risks, while retaining flexibility to respond to unforeseen events. <ul style="list-style-type: none"> <li>– <i>More than 25% of growers have developed a whole-farm business plan which takes account of strategic opportunities, constraints and risks.</i></li> </ul> </li> <li>• Effective management practices for opportunities, constraints and risks are developed, validated and demonstrated in each agroecological zone.</li> </ul>	
Targets	Achievements
The capacity of growers and consultants to characterise soils for plant-available water content and measure soil water availability is increased.	Fifteen introductory workshops and sessions on plant available water content were held, with additional communication through a GRDC fact sheet. Consultants from various grower groups received hands-on training in soil characterisation, either at workshops or through collaborations with researchers.
Research, development and extension work related to retained stubble farming systems in south-eastern Australia is collated and analysed.	A monitoring and evaluation plan was presented at the Stubble Initiative annual meeting held in Melbourne in March 2015.
Collated information on all published documents related to crop rotation, break crops and crop sequencing is available.	A comprehensive report identifying gaps in current RD&E activities relating to crop rotation, break crops and crop sequencing in farming systems across Australia was delivered to the GRDC.
Increased numbers of growers are optimising their cropping systems in response to both opportunities and constraints.	Through GRDC-supported research, the components required to understand and estimate the economic costs and benefits of break crops in crop sequences were assembled for southern and northern Australia. Important links were formed between researchers and growers, with grower groups running crop sequence trials and supplying data on the effects and yields of break crops and pastures.
Strategic decisions and practices are tested, validated and demonstrated in each agroecological zone, and captured in regionally relevant best management practice publications.	<p>Publications were finalised in the areas of:</p> <ul style="list-style-type: none"> <li>• the impact of canola in crop sequences on profit and herbicide-resistant ryegrass</li> <li>• the magnitude and mechanisms of persistent crop sequence effects on wheat</li> <li>• methods of quantifying the potential contribution of legumes to future food security and climate change mitigation.</li> </ul> <p>Regional analyses and model predictions for the use of broadleaf species in crop sequences were reported to grower groups and covered in GRDC updates.</p>



**Table 15: Theme 4 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
<p>Increased numbers of growers use and have greater knowledge of the benefits of rhizobium inoculation and best practice techniques for maximising nitrogen fixation in their cropping systems.</p>	<p>Over the past three seasons, five field trials were completed to assess the symbiotic capacities of pea genotypes. The results are being used to develop a symbiotic rating scale, to assist growers in the selection of pea cultivars with high nitrogen fixation potential and to highlight opportunities for improvement to pulse development programs.</p>
<p><b>Responding tactically (individual crop agronomy)</b>  <b>Practice changes and key metrics</b></p> <ul style="list-style-type: none"> <li>• An increased proportion of growers use crop-specific best management practices to optimise their tactical (within season) agronomy for each individual crop.</li> <li>• Growers use improved strategies to cost-effectively acquire crop inputs.</li> </ul>	
Targets	Achievements
<p>Growers have access to regionally relevant best management practice publications.</p>	<p>Data generated by the GRDC-supported Variety Specific Agronomy project was directly delivered to more than 1,355 industry beneficiaries at field days, site visits, GRDC updates, pre-season and industry meetings, technology updates, conferences, industry forums and workshops.</p> <p>In addition, 39 written publications were generated, including trial reports, conference proceedings, field day booklets, and media articles in local, regional, state and national newspapers and industry journals.</p>
<p>Information on plant growth regulators' current use in Australia, product development, global usage and future roles in the Australian grains industry is available to the GRDC.</p>	<p>A scoping study including a situational analysis relating to the current and future roles of plant growth regulators was produced, to guide future research funding by the GRDC.</p>
<p>Management guidelines for newly accredited malting cultivars are available.</p>	<p>The Southern Barley Agronomy project extended trial results to more than 3,565 industry beneficiaries through field days, site visits, GRDC updates, pre-season and industry meetings and other forums. Trial information was also extended through social media, email and membership networks.</p> <p>The project produced 20 publications, including trial reports, field day booklets, GRDC update papers and articles in industry magazines and other print media.</p>
<p>Robust, region-specific recommendations for varietal selection and management to maximise productivity and resource use efficiency in dual-purpose cereal and canola crops in mixed farming systems are available.</p>	<p>A prototype grazing tool was developed to utilise the relationship between potential grain yield and biomass at flowering to provide an estimate of the residual biomass required at various lock-up dates to achieve a given yield potential. The tool is being validated through existing data and will be provided to grower groups for further testing.</p>
<p>Information on safe grazing periods and grazing methodologies that reduce the impact on crop yield is offered in all major cropping regions in Australia.</p>	
<p>Guidelines on seasonal suitability of early sowing and the management for early sown crops are developed for the Southern Region.</p>	<p>Research plans were implemented and data was successfully gathered from experiments, conducted by Southern Region grower groups, which defined management practices to maximise yield in early-sown wheat. The experimental results and identified management practices will be incorporated into regional management guidelines.</p>



**Table 16: Theme 4 performance against portfolio budget statements measures for 2014–15**

Key performance indicator	Target	Result
Growers place a high importance on the use of decision tools to assist them with strategic or tactical decision-making.	70%	Achieved. Results of the 2014 Grower Survey <sup>a</sup> showed that 77% placed high importance on decision support tools.
Growers have a whole-farm business plan which takes account of strategic opportunities, constraints and risks.	25%	Results of the 2014 Grower Survey <sup>a</sup> showed that 20% of growers had developed whole-farm business plans.

<sup>a</sup> These performance indicators are included in the GRDC Grower Survey every second year. Data will next be collected in the 2016 Grower Survey.

## What's in the RD&E pipeline for 2015–16?

- Research on the future of farm automation and robotics.
- A sociological study to identify the impediments to adoption of break crops.
- A scoping study to benchmark all grains regions for partial factor productivity, partial nutrient balance and agronomic efficiency, and identify how much variability exists between farms, statistical local areas and regions for the major crops.
- A scoping study to identify ways to best manage nutrient stratification in Australian agricultural systems.



Unmanned aerial vehicles are predicted to become an increasingly cost-effective way to monitor crops for weeds, pests and diseases, as well as agronomic conditions such as nutrient status. Photo: GRDC



# Theme 5—Improving your farm resource base

This theme is focused on protecting and enhancing the farm's soil, water, habitat and atmospheric resources to maintain production performance under a variable climate and to demonstrate to consumers and the wider community the sustainable nature of Australian grains production.

Australian grain growers operate in a variable climate and will be significantly affected by climate change. In addition, growers will need to react to Australian Government and international policies, programs and market expectations set in response to climate change—for example, in relation to greenhouse gas emissions.

These impacts need to be understood so that the industry can minimise risk and maximise opportunities. The issues of climate variability and change need to be factored into both seasonal and longer term farm business decisions.

Within the context of a changing climate, soil, water, habitat and atmospheric resources need to be improved across the environment in which the industry operates. Soil carbon is declining in many grains catchments, as is soil pH. Although water consumption by agriculture is being reduced and becoming more efficient, water quality in some key catchments requires further management. Native vegetation communities have become highly fragmented, affecting both biodiversity balance and the potential for exploitation as habitat for beneficial organisms.

In addition, as consumers are becoming more interested in how the food they buy is produced, the grains industry needs to be able to communicate its commitment to good stewardship. The 'Improving your farm resource base' theme will assist growers, across the industry and as individual producers, to demonstrate that they are using chemicals and fertiliser wisely and caring for the land.

The following sections describe some highlights of RD&E investments that addressed this theme in 2014–15.

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## Seasonal climate forecasts

In partnership with the Bureau of Meteorology and CSIRO, the GRDC-supported Managing Climate Variability program invests in projects to develop seasonal climate prediction systems and applications, with a focus on climate variables that shape decision making for farmers. The major output of these investments is the Predictive Ocean Atmosphere Model for Australia (POAMA), which forecasts weather.

Forecasting systems which rely on historical observations are becoming less reliable as climate is changing. Unlike those systems, POAMA forecasts new climatic conditions using real-time climate information and modelling based on interactions between the ocean and the atmosphere.

POAMA was first deployed in 2002. The current version, POAMA-2, forms the basis for a range of climate forecast products that can be accessed via the Bureau of Meteorology website ([www.bom.gov.au/climate/ahead](http://www.bom.gov.au/climate/ahead)), including El Niño forecasts and the monthly seasonal outlook.

Seasonal forecasts based on POAMA-2 can provide measurable benefits to grain growers, for example, by predicting median rainfall and extreme heat or cold events.



Along with soil type, rainfall is a key factor in determining the production benefits growers can achieve from tactical nitrogen application. POAMA outlines the most likely seasonal rainfall conditions, giving growers a basis on which to allocate their nitrogen budget.

A case study recently conducted in Western Australia showed that adjusting nitrogen applications based on the POAMA median rainfall forecast could increase a wheat grower's gross margin by 71 percent or about \$67 per hectare (2012 values) on a typical farm on clay soil. Four other case studies, conducted in southern New South Wales, indicated that similar results should be achievable in the eastern Australian wheat belt, with minimal increase in risk. By selectively applying fertiliser in forecast wet years, gross margins can be improved by around \$50 per hectare, within an 80 percent level of certainty, in three to eight years.

Heat stress affects approximately 12.3 million hectares of cropping land across Australia, representing 19.8 million tonnes of crop production. Production lost due to heat stress costs growers more than a billion dollars per year for wheat alone, and around \$1.7 billion in total if crops such as barley, canola, chickpeas and field peas are included.

Forecasts of the risk of extreme heat at particular times of the year can aid grain growers to minimise losses by strategically scheduling operations such as planting, irrigation, fertiliser application, harvesting and hazard reduction burning. POAMA's ability to forecast heat extremes on multiweek timescales has the potential to help wheat growers reduce yield loss due to heat stress by up to 30 percent.

## Soil organic carbon

Traditional crop management practices such as burning crop residues and heavy tillage have reduced the amount of organic carbon in Australian soils. Carbon stored in organic matter in the soil benefits soil function and fertility, and is integral to sustainable agricultural production. Improved land management practices that increase the amount of organic carbon stored in soils have potential to boost fertility and help offset greenhouse gas emissions.

In 2014–15, the GRDC supported research to:

- improve knowledge of the carbon currently stored in Australian soils, to establish a baseline for change and help identify the areas with the highest potential for increase
- help growers and advisers better understand how management practices to increase soil organic carbon may affect farm productivity, profitability, ecosystem function, inputs and risk.

Measuring soil organic carbon often falls outside the main priorities of growers in terms of soil fertility, because other soil constraints—such as acidity, water repellence and nutritional constraints—often require more urgent attention. However, addressing these major soil constraints increases plant growth and yields, which, in turn, leads to more sustained increases in soil organic carbon.

A recent GRDC-supported project in Western Australia sought to increase growers' knowledge and understanding of the role of soil organic carbon in managing water repellence, nitrogen fertiliser budgets and soil fertility under common farm management strategies such as reduced tillage. The research focused on the functional value of organic matter in supporting crop production through nutrient supply, water dynamics, soil biology and soil structure.

The project reached more than 2,000 growers and advisers through interactive events such as workshops, seminars and field days. In partnership with grower groups, the project successfully trialled a range of innovative strategies to sequester carbon.

A survey of participants found that, when considering all practices available to landholders to influence soil organic carbon, more than 50 percent of growers ranked stubble retention in the top three most important. Minimising tillage, rotational management, ameliorating soil constraints and increasing net primary productivity were also considered important. Less importance was placed on grazing management, biological systems, perennial pastures, added off-farm organic inputs and increased ground cover.

The research confirmed that on-farm monitoring for soil quality ensures that growers remain engaged with the health and productivity of their soils, especially soil carbon, and have the capacity to apply new knowledge and research outcomes to their own practices.



## No-till cropping systems

The key components of conservation agriculture ('no-till') systems are minimal soil disturbance, retention of crop residue, and diverse rotations, including use of break crops. In deciding whether to adopt a no-till approach, growers must weigh up the demonstrated benefits of each of those practices against their costs, and against the benefits of alternative practices, such as use of tillage to combat herbicide-resistant weeds.

To help provide evidence for such decisions, the GRDC supports a Western Australian project to determine the long-term benefits of no-till systems, in terms of crop yields, water use efficiency and soil quality. The project, which commenced in 2006, completed its eighth year of cropping and the second phase of its third three-year rotation in 2014–15.

The project is monitoring the outcomes of four different philosophies to crop management:

- maximum (short-term) profit—current farmer practice with low residue retention
- maximum carbon input—low crop diversity with maximum residue retention
- maximum diversity—high crop diversity with maximum residue retention
- controls—continuous wheat with maximum residue retention.

Crop establishment, growth, biomass, water use, yield and residue levels are assessed each season, as are weeds, insects and diseases. All of the inputs and yields are taken into account when calculating the economics of each crop treatment each season.

Results to the end of the 2014 season showed that high-quality no-till cropping systems with permanent soil cover and high levels of residue reduce soil erosion. The results also suggested that no-till cropping systems improve soil health, as measured by slightly increased nutrient cycling and levels of organic carbon sequestered in the soil. Residue levels had little impact on soil water retention over summer, but did reduce evaporation in autumn.

However, residue management issues meant that no-till systems had no yield benefit. Levels of residue as high as 5 tonnes per hectare reduced crop yield slightly in 2014, because seeding machinery could not operate properly, causing poor crop establishment. These results show that in high-yielding situations such large levels of crop residue can compromise no-till cropping, and practices that reduce stubble loads may be necessary, even if the amount of carbon input into the soil is slightly reduced. The precise effects of the high residue levels on soil organic carbon will be known after the 2015 season, when extensive soil samples will be taken.

In terms of economic benefits, the research found that while there are differences between treatments, the season is the dominant factor. The profit achieved from diverse rotations with break crops was highly variable compared to the continuous wheat system. However, continuous wheat is not without its own long-term risks. The yield of the continuous wheat rotation was stable until 2012 (six seasons) but is now declining. The trials showed an increase in stubble- and soil-borne diseases, pest and weed pressures, and a higher requirement for inputs including herbicides, fungicides and fertilisers.

In 2014–15, information from the project was extended to growers and advisers through field days, conferences, the internet and the print media. Site visits were also conducted by farming groups, agronomists, industry representatives and students.



A clod of earth showing an earthworm tunnel points to the high levels of microbial activity achieved through long-term no-till practices on the Hamilton family's property at Condamine in Queensland. Photo: Clarisa Collis



# CASE STUDY: NATIONAL AGRICULTURAL NITROUS OXIDE RESEARCH PROGRAM

When nitrogen from fertilisers is lost from cropping soils as nitrous oxide, crop production and profits are reduced and greenhouse gas emissions are increased. Nitrous oxide is a potent greenhouse gas. While the rates of nitrous oxide losses from soils that support the Australian grains industry are low by world standards, there is scope for most grain growers to increase crop production and profit by reducing these nitrogen losses.

The GRDC invests in the National Agricultural Nitrous Oxide Research Program to provide a coordinated, national approach to research on reducing nitrous oxide emissions. The first round of projects under the program commenced in June 2012 and was completed in June 2015. Findings of interest to grain growers include:

- The soil type, cropping system and climate can all significantly influence gaseous nitrogen losses. In winter cropping regions, nitrous oxide emissions often increase in response to summer rainfall—up to 80 percent of annual losses can occur in this period. This emphasises the need to minimise any unused nitrogen left in the soil after harvest.
  - The nitrogen fertiliser needs of a crop should be calculated based on the target yield (as informed by historical performance, soil moisture data and climate forecasts), the nitrogen expected to be provided by the soil (through mineral nitrogen reserves and mineralisation), and the nitrogen responses of particular crops and paddocks.
  - Where rainfall patterns allow, fertiliser application should be split, applying minimal fertiliser at sowing followed by additional fertiliser later in the season, informed by data on soil moisture and the nitrogen status of the crop. The split application approach may be risky in the Northern Region due to a dominance of alkaline soils (which promote gaseous nitrogen losses) and the high variability of rainfall events.
  - Under conservation agriculture systems, residue retention tends to increase the potential for nitrous oxide emissions, but under most dryland cropping conditions any increase would be small and outweighed by a reduced need for nitrogen fertiliser because the increased soil organic matter supplies more of the crop's needs. Greater use of grain legumes as break crops (also part of conservation agriculture) will also increase organic forms of nitrogen in the soil and reduce the need for fertiliser applications.
- The gradual increase of grain cropping in high-rainfall zones brings particular risks of large nitrogen losses during the conversion of continuous pastures with high soil carbon levels to crops with added fertiliser nitrogen. Moving from a long-term pasture into a cropping phase can result in considerably larger nitrogen losses if the pasture is spray-topped or terminated early in spring (October) rather than late autumn (May).
  - In irrigated cropping trials, splitting the irrigations into a greater number of smaller irrigation events reduced nitrogen losses without affecting crop growth. This technique is also likely to improve the efficiency of water use.
  - Banding nitrogen fertiliser where it can be more easily taken up by growing roots (especially when applied in several small bands near the seeds, with low nitrogen quantities) can increase the proportion of nitrogen absorbed by sorghum crops, and reduce the potential for nitrogen losses.
  - The effects of several nitrification inhibitors applied to the nitrogen fertilisers were variable, and further research is needed before their effectiveness can be fully understood.



Researchers from the National Agricultural Nitrous Oxide Research Program use gas collection units to measure the amounts of nitrous oxide released by cropping systems. Photo: GRDC



**Table 17: Theme 5 performance against GRDC strategic measures**

Theme 5—Improving your farm resource base	
<b>Aspirational outcome (10+ years)</b>	<i>Grain growers are valued for adopting practices that improve regional habitat, soil, water and atmosphere resources in a changing climate.</i>
<b>Intermediate outcomes (5 years)</b>	
<b>Understanding and adapting to climate variability</b>	Farm business plans provide the flexibility to respond to the risks and opportunities of a changing and variable climate.
<b>Improving soil health</b>	Soil health is improved and soil, nutrient and chemical losses are reduced.
<b>Managing water use on dryland and irrigated grain farms</b>	Water use efficiency, quality and availability are improved on dryland and irrigated grain farms that manage the risk of off-farm impacts, including soil, nutrient and chemical run-off, and dryland and irrigated salinity.
<b>Understanding and valuing biodiversity</b>	Biodiversity is managed on farm for ecosystem services (such as habitat, amenity, pollination and profitability).
<b>Communication of sustainable production methods</b>	Markets and the broader community recognise the environmental credentials of grain farm businesses.
<b>Expenditure for 2014–15</b>	\$14.64 million

### Performance for 2014–15

#### Understanding and adapting to climate variability

##### Practice changes and key metrics

- Growers integrate weather data with other resource inputs to predict, plan and assess farm performance.
- Growers use improved seasonal forecasts and tools to manage their farm business in response to climate variability.
- Growers seek information about the possible impacts of long-term climate changes on crop growth patterns and adopt enterprise and crop decisions and agronomic practices required to optimise profit and manage risk.
  - *60% of growers consider the potential effects of climate change on their farm business when making long-term decisions.*
- Growers seek information about potential mitigation strategies to reduce on-farm greenhouse gas emissions, and adopt them where feasible.
- Researchers incorporate farm-scale data in the improvement of climate and weather modelling.

#### Targets

Growers factor into their long-term planning the potential effects of climate change.

A range of farming system options to respond to climate variability and change are developed and tested for each major grain-growing region.

Increased number of growers use seasonal forecasts, local climate data and decision tools to help predict and plan likely crop and farming system performance, and in their tactical (seasonal) decisions.

Increased number of growers are aware of their farms' greenhouse gas emissions profiles and are adopting appropriate mitigation strategies.

#### Achievements

Research was undertaken to quantify the impacts of elevated carbon dioxide levels on grain yield and quality. Nitrogen management is critical in an atmosphere of elevated carbon dioxide.

An examination of the benefit:cost ratios of a range of adaptive management options in 14 agroecological zones was undertaken.

Further improvements were made to the Predictive Ocean Atmosphere Model for Australia (POAMA).

A series of life cycle analysis pilots to quantify the levels of greenhouse gas emissions from grain production were undertaken. Practices to reduce nitrous oxide emissions were developed and extended to growers.

#### Improving soil health

##### Practice changes and key metrics

- Growers adopt agronomic practices that improve the chemical, physical and biological health of the soil for sustained productivity.
  - *60% or more of growers undertake activities to improve the condition and productive capacity of their soils.*
- Growers understand and manage the impact of farming practices on soil health in order to maintain or increase productive potential.
- Growers increase the extent and quality of ground cover to improve soil health and minimise loss.



**Table 17: Theme 5 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
Increased number of growers regularly measure the health (productive capacity) of their soils and incorporate the information into their land use and cropping decisions.	Results of the 2014 GRDC Farm Practices Survey showed that 25% of growers factor soil health into their stubble management decisions.
Growers are aware of and are adopting management practices that will maintain and improve their soils' productive capacity and minimise losses due to erosion.	Results of the 2014 GRDC Farm Practices Survey showed that the proportion of growers burning stubble early and therefore leaving soil uncovered over summer has declined, from 5% in 2011 to 3% in 2014.
<b>Managing water use on dryland and irrigated grain farms</b> <b>Practice changes and key metrics</b> <ul style="list-style-type: none"> <li>• Growers manage water quantity and quality on farm to improve efficiency of water use.</li> <li>• Growers implement appropriate and efficient practices that minimise adverse impacts on surface and groundwater quality leaving the farm. <ul style="list-style-type: none"> <li>– <i>At least 65% of growers use nutrient budgeting to better match application with anticipated crop needs.</i></li> </ul> </li> </ul>	
Targets	Achievements
Increased number of growers regularly measure soil moisture to set target yields and determine optimum levels of crop inputs (including irrigation water).	Results of the 2014 GRDC Farm Practices Survey showed that the percentage of growers measuring soil moisture at sowing has increased, from 27% in 2011 to 58% in 2014. The percentage of growers measuring soil moisture during the season increased from 25% in 2011 to 34% in 2014.
Increased number of growers assess groundwater levels to avoid the risks of waterlogging and salinity.	Results of the 2014 Grower Survey <sup>a</sup> showed that the proportion of growers monitoring the depth to the water table increased slightly to 23% in 2014 from 22% in 2012.
Increased number of growers test the quality of water used on farm (including for stock or for spraying) and of water leaving the farm.	A survey of grower practice will be undertaken in the 2016 GRDC Grower Survey.
<b>Understanding and valuing biodiversity</b> <b>Practice changes and key metrics</b> <ul style="list-style-type: none"> <li>• Growers and their advisers recognise the potential benefits of biodiversity in the landscape to their farming systems.</li> <li>• Growers understand the likely effects of alternative land use decisions based on sound data, and use this to make assessments of land capability and use.</li> <li>• Growers integrate the management of vegetation with high biodiversity value to meet farm business objectives (e.g. managing frost, providing shelter, accessing emerging carbon markets, managing salinity, applying area-wide integrated pest management or maintaining lifestyle objectives/farm aesthetics).</li> </ul>	
Targets	Achievements
Growers develop and adopt vegetation management plans for their farms to assist crop production (e.g. through maintaining beneficial insects or using windbreaks), or to access additional sources of farm income (e.g. from agroforestry or carbon farming).	Results of the 2014 GRDC Farm Practices Survey showed that 35% of growers have vegetation management plans.
Growers use vegetation plans to assist in identifying and conserving areas of native vegetation important for local or regional biodiversity, production benefits, or farm amenity.	Results of the 2014 GRDC Farm Practices Survey showed that, among growers who have a vegetation management plan, 37% use the plan to assist with crop production, 25% use it to provide additional income, and 87% use it for biodiversity and amenity benefit.
<b>Communication of sustainable production methods</b> <b>Practice changes and key metrics</b> <ul style="list-style-type: none"> <li>• Growers recognise themselves as sustainable food producers rather than bulk commodity producers.</li> <li>• Growers communicate their responsible use of farm inputs and the natural resource base to the broader community.</li> <li>• Growers understand, calculate and communicate the carbon and water footprint of the products they produce.</li> </ul>	



**Table 17: Theme 5 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
Increased number of growers adopt quality assurance, environmental management systems or other stewardship approaches to assist them in meeting market requirements, enhance their recognition as producers of quality products, and meet community expectations of sustainable land use.	Results of the 2014 GRDC Farm Practices Survey showed that 17% of growers had a quality assurance or environmental management system in place. The highest proportions of growers using environmental management systems were in Tasmania (>40%) and Western Australia (>30%).
Growers are aware of and actively participate in catchment management plans and programs.	Three new projects (one in each GRDC region) were established to better link farm practices with catchment management planning.

a These performance indicators are included in the GRDC Grower Survey every second year. Data will next be collected in the 2016 Grower Survey.

**Table 18: Theme 5 performance against portfolio budget statements measures for 2014–15**

Key performance indicator	Target	Result
Growers consider the potential effects of climate change on their farm business when making long-term decisions.	50%	Achieved. Results of the 2014 Grower Survey <sup>a</sup> showed that 59% of growers were adopting new or different management practices to actively manage climate variability, and 53% considered the potential effects of climate change when making long-term decisions.
Growers undertake activities to improve the condition and productive capacity of their soils.	70%	Achieved. Results of the 2014 Grower Survey <sup>a</sup> showed that 94% of growers had undertaken activities to improve the condition and productive capacity of soils.
Growers use nutrient budgeting to better match application with anticipated crop needs.	55%	Achieved. Results of the 2014 Grower Survey <sup>a</sup> showed an increase in the proportion of growers using nutrient budgeting, to 68% in 2014 from 56% in 2012.

a These performance indicators are included in the GRDC Grower Survey every second year. Data will next be collected in the 2016 Grower Survey.

## What's in the RD&E pipeline for 2015–16?

- A major initiative to improve the chemical, physical and biological health of Australian soils, consistent with the National Soil RD&E Strategy. This initiative builds on projects in the Western Region, and will focus on:
  - the costs of soil constraints to growers and industry
  - dispersive sodic and magnesian soils, including breeding approaches to improved crop emergence
  - innovative approaches to managing subsoil acidity
  - non-wetting soils
  - subsoil constraints.
- A review of information that will inform future investment in the ability of grain growers and advisers in low-rainfall and marginal areas to better manage adverse and extreme seasons through knowledge of:
  - potential climate scenarios across ten, 20 and 30 year timescales
  - nationally and internationally available weather prediction models and services
  - ways in which leading growers maintain viability under variable and/or extreme climatic conditions, including triggers for tactical and strategic decision making
  - genetic material available in cereals, pulses, oilseeds and pastures (suitable for cropping systems) that has superior performance and adaptability in low-rainfall and high-stress environments.



# Theme 6—Building skills and capacity

This theme is focused on generating leadership, innovation and education in the grains sector.

To compete and succeed internationally, the Australian grains industry needs a highly skilled and motivated workforce, including growers, advisers, researchers and managers. The industry has identified several critical challenges:

- the grains industry and farming are becoming increasingly complex, with many types and sources of information that growers need to make decisions
- the number of appropriately skilled researchers and advisers being trained to replace the current generation is inadequate—this is compounded by a large number of experienced people reaching retirement age
- agricultural careers are not traditionally attractive to potential candidates
- the grains industry lacks a whole-of-industry approach to building skills and capacity
- growers are time-poor and face succession-planning changes
- the uptake of technology often requires substantial technical support.

Through the 'Building skills and capacity' theme, the GRDC has identified opportunities to focus its investment to address these challenges.

The following sections describe some highlights of RD&E investments that addressed this theme in 2014–15.

## Extension Adoption Training and Support Program

The important role that agronomic advisers play in the success of the Australian grains industry is well recognised. However, although many advisers are highly skilled in their areas of technical expertise, many have not had formal training in the skills that underpin effective extension—which leads to adoption—of best practice advice. Experienced advisers are also increasingly being expected to act as mentors for younger colleagues, without the benefit of formal training in mentoring and evaluation processes.

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The GRDC supports a training program that aims to build extension skills among grains industry advisers and develop a network of extension specialists who work directly with farmers in the Southern Region.

Participants undertake training, field tours and projects to build their extension and communication skills while actively mentoring less experienced people with interests in the grains industry. Eight advisers completed the program in 2014, bringing the total to 33 participants over four years.

The focus on mentoring training was increased in 2014. Participants received guidance on establishing formal mentoring agreements or setting boundaries for informal arrangements. The people who received mentoring included fellow agronomists, undergraduate students of agriculture and a high school student with an interest in pursuing agriculture as a career. Mentors reported that they had found the process very useful and would consider mentoring again.

The areas of interest that participants chose for projects in 2014 included:

- reviewing a funding proposal form, to assist researchers to think more strategically about how their results will be extended to the target audience



- designing a ‘dart board’ approach to evaluation of field days, to increase participation in evaluation
- producing a series of YouTube clips to communicate agronomic messages
- introducing clients and colleagues to the WhatsApp smartphone app as a channel for communication
- identifying client needs, and working with clients in ways that are more timely and effective and reduce risk of adviser burnout.
- have improved facilitation and mentoring skills, and improved ability to communicate research outcomes to farmers
- are more aware of the activities of the GRDC.

A 2014 survey of the previous year’s participants showed that their better use of communication and technology had led to an increase in adoption by their clients.

## Nuffield Australia Farming Scholarships

The Nuffield Australia Farming Scholarships program gives Australian primary producers the opportunity to travel overseas to study research topics relevant to their farming operations. As well as increasing practical farming knowledge and management techniques, the scholarships provide a better understanding of the forces shaping international trade policy and consumer sentiment, and technological advances being made overseas.

The GRDC supported scholarships for four grain growers—two from the Northern Region and one each from the Southern and Western regions—in 2014–15.

The 2014 field tour took participants to New Zealand, to learn about the strategic approach that agricultural peak bodies such as Beef + Lamb New Zealand, DairyNZ and the Foundation for Arable Research have adopted to ensure that farmers are engaged in the RD&E process.

On completing the program, participants:

- understand differences in learning styles, personality types and decision-making processes
- are better equipped to plan and deliver research and extension programs

### GRDC Nuffield Scholars



Reece Curwen, from South Stirling in Western Australia, is investigating the dynamics between broadacre farming and the management systems used to maximise productivity.



Andrew Freeth, from Collie in New South Wales, is studying investment in on-farm grain storage and supply chain logistics.



Jock Graham, from Coolac in New South Wales, is studying communication technology solutions for farm enterprises.



Adam McVeigh, from Dalby in Queensland, is researching ways to achieve sustainable high yields from continuous double cropping with overhead irrigation.

Photos: Nuffield Australia



## Traineeships in applied grains research

Many young university students and graduates with research skills in science and resource management do not consider building their futures in agricultural research, because it is perceived to offer poor job security and limited scope for career development. At the same time, agricultural research agencies are finding it difficult to recruit appropriately trained young people to undertake important projects, particularly in applied R&D.

In the Southern Region, the GRDC is supporting a series of traineeships in areas of applied R&D that benefit the Australian grains industry. The traineeships aim to give outstanding students a broad overview of the fundamentals of applied R&D and encourage them to pursue applied research as a career.

The traineeships are provided in partnership with the South Australian Grains Industry Trust, the South Australian Research and Development Institute (SARDI) and the University of Adelaide. Participants take part in practical work experience at the Waite Research Institute and other research sites around South Australia.

Two types of traineeship are available: 12-month internships for graduates, and short-term work placements (for six weeks or the equivalent) for undergraduates. The short-term traineeships can be counted towards the work placement requirement for the University of Adelaide's Bachelor of Agricultural Sciences degree.

Students are selected on merit by a selection committee including representatives from the university, SARDI, and the grains industry. The program targets high-quality students who have a demonstrated aptitude for research in agricultural science, soil science or natural resource management. In addition to academic performance, the student's interest in and potential for pursuing a career in grains R&D are taken into consideration.

The first year of the program attracted a strong field of applicants. Two graduates commenced traineeships in 2014–15—one working in cereal and pulse pathology; the other studying climate challenges, and pulse agronomy. Four second-year agricultural science students undertook six-week work placements with SARDI's crop physiology, crop pathology and entomology teams during the summer break between semesters.

The program has been well received by students and researchers.

## Grains Industry Research Scholarships

The GRDC offers research scholarships to encourage postgraduate training in disciplines that contribute to the RD&E priorities of the GRDC and the Australian grains industry. These scholarships are awarded on the basis of academic excellence, the topic of the proposed research and the likelihood that the applicant will stay involved in the grains industry.

The GRDC particularly encourages research in disciplines and subject areas that have been identified as having current and future capability gaps, based on audits undertaken by a range of organisations and confirmed through the *Grains Industry National Research, Development and Extension Strategy*.

In 2014–15, the GRDC supported 14 PhD scholars working across a range of subject areas, including:

- prediction of soil properties and variability
- the relationship between stress tolerance genes and grain quality in barley
- modification of photosynthesis in crop plants through gene replacement
- stabilisation of the flowering time of wheat, in response to autumn rainfall decline in the Southern Region
- structural and functional analyses of stem rust resistance in wheat proteins
- genomic research to improve the value of narrow-leafed lupin grain.



# CASE STUDY: 'IN GRAINS' INVESTING IN YOUNG SCIENTISTS

To produce grain crops that continue to meet market demands in an ever-changing business environment, Australia needs a highly skilled and motivated workforce, including growers, advisers, researchers and managers.

In recent years, the number of experienced people leaving the grains industry through retirement has exceeded the number of young people entering the industry. To help reverse this trend, the GRDC supports a range of educational opportunities, from primary school to postgraduate levels, to encourage young Australians to consider building their careers in grains.

In particular, the GRDC provides scholarships for students conducting undergraduate honours or postgraduate PhD research in areas that contribute to the priorities of the Australian grains industry. Projects may be in areas of fundamental research, such as molecular biology, pathology or biochemistry, or applied research, such as herbicide resistance, equipment design or agronomy.

*'In GRAINS' Investing in Young Scientists*, published by the GRDC in April 2015, showcases the experiences of 30 young people who received support from grains research scholarships. It includes the details of their research projects, illustrating the range and diversity of the research undertaken. Lists of the publications arising from the projects demonstrate the breadth of scientific knowledge that they have contributed to the grains industry.

Each person's profile also outlines how their career has progressed since their studies. Most are still associated with the Australian grains industry, either as researchers or in areas as diverse as science teaching, agribusiness banking, patent law, plant breeding and agronomy. One scholar has returned to his family farm, and is putting the skills and networks he developed during his studies to practical use as a grain grower.



This publication showcases the work of outstanding young scholars whose work has contributed to the intellectual capital of the Australian grains industry, with GRDC support. Photo: GRDC

The profiles also provide personal insights on the highs and lows of the scholarship experiences, and advice for others considering similar studies. Several former scholars describe how the direct relationship with industry that the GRDC scholarship provided helped their projects to be focused, relevant and successful.

*'In GRAINS' Investing in Young Scientists* can be downloaded for free from the GRDC website ([grdc.com.au/resources/Bookshop](http://grdc.com.au/resources/Bookshop)).



**Table 19: Theme 6 performance against GRDC strategic measures**

<b>Theme 6 – Building skills and capacity</b>	
<b>Aspirational outcome (10+ years)</b>	<i>A dynamic Australian grains industry with the skills and capacity to continuously innovate.</i>
<b>Intermediate outcomes (5 years)</b>	
<b>Grains industry leadership and communication</b>	The Australian grains industry has the leadership and communication capacity to proactively engage with the broader Australian community.
<b>Capacity building in the extension sector</b>	Australia has a skilled agricultural extension sector with access to appropriately skilled people.
<b>Capacity building in the R&amp;D sector</b>	Australia has world-class R&D personnel with the appropriate skills to meet current and future needs of the Australian grains industry.
<b>Capacity building for grain growers</b>	Growers recognise the benefits to their businesses of acquiring additional skills and knowledge and hence the value of their participation in training and continuous learning.
<b>Expenditure for 2014–15</b>	\$9.93 million

### Performance for 2014–15

#### Grains industry leadership and communication

##### Practice changes and key metrics

- An increased number of industry participants are engaged in regional and national leadership roles in the Australian grains industry.
  - *At least three Nuffield scholars are from the grains industry each year.*
- The grains industry communicates information about potential career opportunities to secondary and tertiary students and their parents and career advisers.
- The grains industry publicises how it benefits the wider community.

#### Targets

Leadership positions within the Australian grains industry can be filled with minimal delay by candidates who have the skills, knowledge and experience required.

The GRDC invests in a number of initiatives that promote, and prepare students for, the diverse range of career opportunities available in the grains industry.

The GRDC invests in a number of programs that promote a greater awareness of the role and importance of the Australian grains industry.

#### Achievements

The GRDC invested in a number of leadership development activities. This included sponsoring:

- four participants in the 2015 program of Nuffield Australia Farming Scholarships
- two participants in the Australian Rural Leadership Program.

The GRDC invested in agricultural training awards, Horizon scholarships and the CSIRO Plant Industry Summer Student Program.

The GRDC invested in a project, More than Gumboots and Tractors, aimed at engaging career advisers and upskilling them on many grains-based careers, research pathways and opportunities to encourage students to pursue careers in the grains industry.

#### Capacity building in the extension sector

##### Practice changes and key metrics

- The extension sector collates and publishes annually its skills requirements and identifies gaps and potential gaps in discipline areas.
- Increased number of people enrol in targeted agriculture-related disciplines.
- Increased number of qualified graduates are employed in extension roles.
- Increased number of graduates and other extension staff undertake postgraduate/workplace training.
- Career pathways within the extension sector retain skilled and experienced personnel.



**Table 19: Theme 6 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
The extension sector regularly communicates its training requirements for skilled personnel, including any gaps in discipline areas, and provides these to training organisations.	The GRDC funded training for extension professionals through the Extension Adoption Training and Support Program and extension provider upskilling projects. Eight advisers completed the Extension Adoption Training and Support Program.
The GRDC supports a range of programs that increase enrolments in agriculture-related disciplines.	The GRDC invested in the development of a leadership strategy that will outline a business case for continued investment and recommend possible future investment to increase enrolments in agriculture-related disciplines.
Training opportunities that meet the needs of the sector are available through vocational education and training programs, graduate and postgraduate studies, and non-award courses.	The GRDC-supported Resilient Grain Leaders workshops provided an opportunity for 31 industry professionals to improve skills in areas such as leadership, teamwork and performance management.
Increased number of undergraduates successfully complete agriculture-related courses.	The GRDC-supported Sustainable Grains Production Course had 54 students enrolled in 80 units, following on from 100 students in 119 units in 2013–14 and 89 students in 124 units in 2012–13.
The proportion of people in the extension sector with relevant graduate and post-graduate qualifications is increasing.	The GRDC surveyed more than 200 private sector crop advisers in November 2012 to find out the highest level of education they had achieved. This showed that 59% of respondents had obtained a bachelor's degree and 16% had obtained a postgraduate degree. Results also indicated that the proportion of the workforce holding graduate and postgraduate qualifications was significantly more likely to be increasing among younger age groups.

### Capacity building in the R&D sector

#### Practice changes and key metrics

- The grains industry has a clear understanding of its skills requirements in the short, medium and long term.
- Training providers address the grains industry RD&E skills gaps in innovative and flexible ways.
- RD&E providers work with the grains industry to develop improved measures of RD&E performance.

#### Targets

The grains industry, in collaboration with RD&E providers, regularly communicates its anticipated future requirements for skilled personnel, including any gaps in discipline areas, and provides these to training organisations.

The industry and its RD&E providers are maintaining or increasing the skills and capacity available, in line with the *Grains Industry National Research, Development and Extension Strategy*.

#### Achievements

The GRDC invested in the development of a grains industry tertiary education strategy, which will inform the GRDC's future investment in the tertiary education sector.

The GRDC funded 14 students to complete PhDs and 14 students to complete honours projects.

### Capacity building for grain growers

#### Practice changes and key metrics

- Growers recognise the additional knowledge and skills they need to fully understand, adapt and adopt the outputs of RD&E and optimise their benefits.
- Growers and their advisers participate in relevant training and skills development and apply the knowledge gained to on-farm decisions and practices.
  - *At least 65% of growers and advisers undertake at least one activity each year to learn more about opportunities to improve farm profit or sustainability.*
- Growers apply skills on farm to increase profitability and sustainability.



**Table 19: Theme 6 performance against GRDC strategic measures** (continued)

Performance for 2014–15	
Targets	Achievements
Increased number of growers regularly use the support of a skilled adviser to assist with cropping and business decisions.	The GRDC funded a study to gain an understanding of how growers and advisers source, notice, evaluate and use the substantial amount of information available to assist them to make decisions. Information gained from the project will inform future GRDC investments.
An increased proportion of growers and advisers are undertaking further education, training and skills development to enable them to make better use of RD&E outputs and increase profitability and sustainability.	The GRDC supported field days, workshops, training sessions and updates where presentations were provided to 8,704 growers and 4,692 advisers. This compares to 21,849 growers and 9,198 advisers in 2013–14.
The GRDC Grower Survey indicates intended practice change on farm as a result of training and skills development.	Results of the 2015 Grower Survey showed that the proportion of growers who had changed their farming practices as a result of GRDC-supported information, training, workshops, projects or other activities had increased to 55% in 2014 from 41% in 2013.

**Table 20: Theme 6 performance against portfolio budget statements measures for 2014–15**

Key performance indicator	Target	Result
Each year Nuffield scholars include people from the grains industry.	At least three	Achieved. The GRDC supported four scholars in the 2015 program.
Growers and advisers undertake at least one activity each year to learn more about opportunities to improve farm profit or sustainability.	70%	In responses to the 2014 Grower Survey <sup>a</sup> , 61% of growers reported that they (48%) or another person from their farm (30%) had undertaken at least one activity over the past year to learn more about opportunities to improve farm profitability or sustainability.

<sup>a</sup> These performance indicators are included in the GRDC Grower Survey every second year. Data will next be collected in the 2016 Grower Survey.

## What's in the RD&E pipeline for 2015–16?

- Adviser training and capacity building, recognising the increasing role of advisers in helping growers to make decisions.
- Farm business management skills development for growers and advisers, to increase the profitability of grain-growing enterprises.
- Establishment of a GRDC alumni group, to assist past scholarship holders to stay in contact with the GRDC.



# Enabling functions

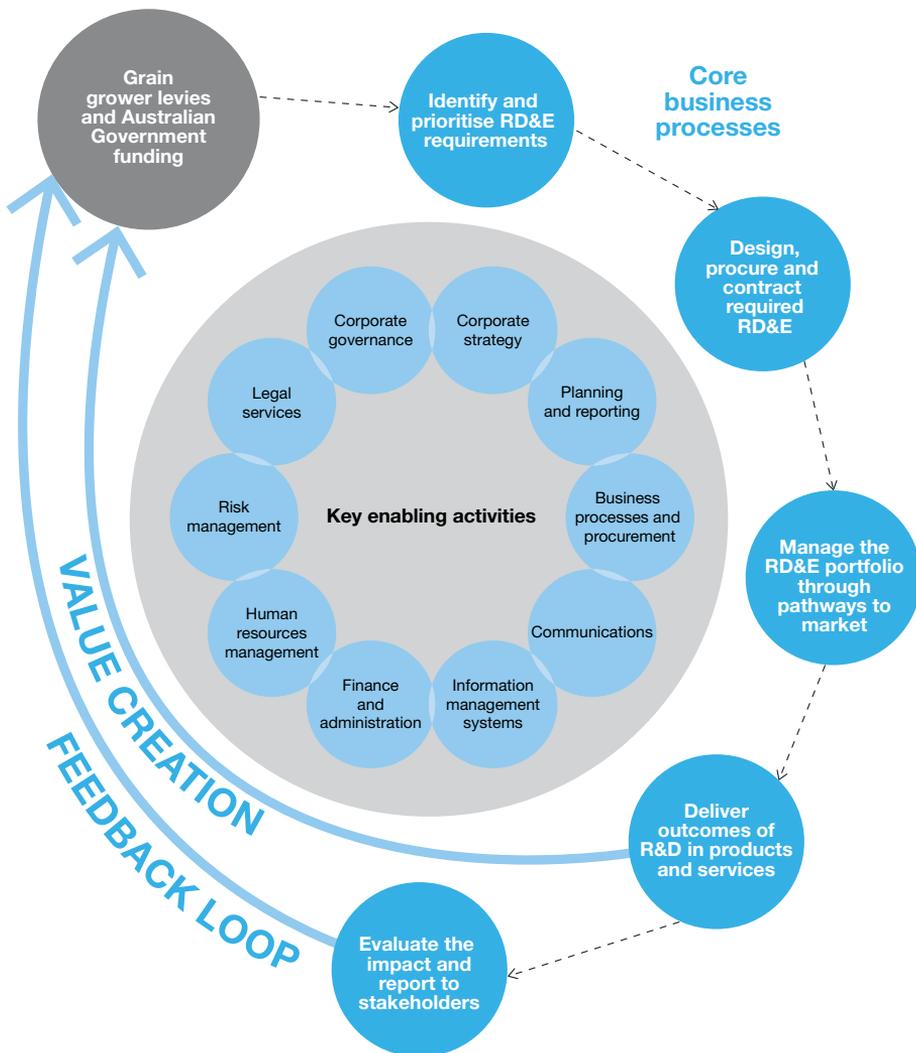
The GRDC's Corporate Services and Communications business groups work with the three operational business groups to implement the GRDC's corporate strategies and achieve the planned outcomes of the GRDC's investment themes.

Corporate Services is responsible for key enabling activities that provide essential support for the effective governance and administration of the GRDC and equip the operational business groups to perform their functions.

Communications is responsible for engaging with key stakeholders and delivering information through a range of channels, to demonstrate the GRDC's focus and achievements and ensure that the GRDC's values and brand are understood.

Figure 10 shows how the enabling activities and their various elements support effective corporate governance and administration to equip the GRDC to be accountable, and deliver value, to grain growers and the Australian Government.

Figure 10: GRDC value chain



# CASE STUDY: SOCIAL MEDIA

Launched in 2014–15, the GRDC's first social media strategy is helping to connect the Australian grains industry to seasonally relevant research, resources and expertise.

The GRDC is using Twitter, Facebook, LinkedIn and YouTube to engage in two-way conversations with the increasing number of growers who use social media to gather information, ask questions and share learnings with other growers, the broader grains sector and the wider community.

The GRDC's social media presence provides industry with opportunities to inform and be involved in the GRDC's research, development and extension investments, while giving GRDC staff real-time access to paddocks and laboratories around the world.

As well as allowing in-depth discussions between growers around the latest on-farm practices, social media provide a mechanism through which the GRDC can identify, track and prioritise issues.

The GRDC's social media strategy also includes a focus on upskilling research providers to ensure that they are equipped to communicate their research online throughout the lives of their projects.

The GRDC's social media channels are:

- Twitter
  - main account: @theGRDC
  - regional updates: @GRDCUpdateNorth, @GRDCUpdateSouth, @GRDCUpdateWest
- Facebook: facebook.com/theGRDC
- LinkedIn: linkedin.com/company/thegrdc
- YouTube: youtube.com/user/theGRDC.



*'Social media channels are providing access to information on emerging research, issues, trends and solutions for grain growers and their advisers.'* — Prudence Cook, GRDC Social Media Adviser. Photo: Geoff Comfort

Collectively, these channels have built an online community of more than 10,000 connected accounts. By 30 June 2015, over 10 percent of the GRDC's web traffic was driven by social media, which delivered over 3,500 clicks on GRDC content and over 1,000 video views every week.

The value and relevance of the GRDC's social media presence is also reflected in comments from growers. For example:

*'The timely and neutral information about recent disease outbreaks in WA coming through the GRDC Twitter account has been critical in helping me manage my fungicide applications.'* — Western Australian grower.

*'I don't tweet much myself, but in terms of understanding what's happening in the grains industry, Twitter is probably my number one information source.'* — New South Wales grower.

*'Being exposed to the conversations growers and researchers are having online encourages me to question my own system and look for options to improve.'* — South Australian grower.



# Portfolio management

The GRDC's RD&E investment portfolio in 2014–15 included 942 projects at various stages of development. The management of the investment portfolio aims to achieve a spread of projects in terms of:

- GRDC investment themes
- the Strategic Research Priorities and Rural R&D Priorities
- crop type
- project type (strategic basic research, applied research, experimental development, extension, commercialisation or capacity building)
- delivery time to growers of R&D outcomes (long-term projects versus short-term projects)
- probability of overall success, taking into account the requirement for a balance between investments with high risks and high potential returns and investments with lower risks and lower potential returns
- the level of expected on-farm benefits relative to investment required
- induced spillover benefits to industry
- expected benefits to be achieved for the broader community.

The GRDC's portfolio is grouped into eight categories: the investments addressing the six strategic themes; investments in foundational activities, such as reviews and impact assessments; and investments in R&D management. This enables groupings of projects that support an investment strategy within a theme to be analysed together.

## Monitoring and review

The GRDC annually assesses the programs of work that are part of its program logic approach to achieving outcomes to benefit Australian grain growers and the wider community. Programs of work are assessed in terms of their expected relative benefit flow to growers, industry and the broader community. The assessments include economic, social and environmental impacts, as demonstrated in Table 7 of this report.

The GRDC undertakes a range of activities to ensure that individual projects achieve their objectives and scheduled milestones, and that the R&D portfolio as a whole continues to

address industry and government stakeholder priorities. The approaches used to monitor, evaluate and manage projects depend on project characteristics: for example, projects with standard GRDC research agreements are evaluated and managed differently from projects involving unincorporated joint ventures.

The portfolio monitoring system includes internal guidelines and/or procedures for:

- identifying and managing risks associated with individual projects during planning and implementation stages
- evaluating progress reports for project performance against objectives and milestones—each year, a satisfactory progress report must be submitted to the GRDC before further payments will be made to the research provider
- conducting formal reviews of targeted investment areas.

## Investment of funds

Under the guidance of the Finance, Risk and Audit Committee and at the direction of the Board, the GRDC reviewed its investment policy in 2014–15.

As a result, the GRDC has made changes to increase the potential return on its investments through active management using two fund managers. This approach was based on the demonstrated performance of portfolio management and thorough investigation by an external funds management consultant.

The revised policy recognises the legislative requirements and restrictions, under section 59 of the *Public Governance, Performance and Accountability Act 2013* and Part 4 of the Public Governance, Performance and Accountability (Investment) Authorisation 2014, that allow the GRDC to invest in only certain types of low-risk deposits. The investments in these categories averaged a return of 3.7 percent over the year.

The GRDC also reviewed its approach to cash management, and engaged an external manager to administer the GRDC's cash funds to optimise return. As noted in the financial statements, at 30 June 2015 the funds were achieving around 1.5 percent to 2 percent return. The GRDC seeks to increase this in future.



# Commercialisation

The GRDC's primary aim is to drive the discovery, development and delivery of world-class innovation to increase the profitability of Australian grain growers and the sustainability of the Australian grains industry. In many cases, the benefits of GRDC research investments can be most efficiently delivered to growers through commercial channels.

## Commercialisation strategy

The GRDC achieves its objective in delivering research outputs through:

- analysing returns on investments to ensure that the GRDC is investing in areas that maximise return to growers
- leveraging capital and expertise from co-investors, to maximise opportunities to bring technology to the marketplace
- adequately protecting intellectual property, to protect the GRDC's investments and leverage co-investment from third parties
- accessing technologies owned by third parties for evaluation and use in Australia
- developing appropriate paths to market for each new technology
- managing the GRDC's commercial investments and partnerships.

As part of the overall delivery strategy, the GRDC recognises that the following are necessary for commercialisation: freedom to operate, a sustainable market size, expertise, funds, and distribution channels.

Usually the GRDC is only one of a number of public and/or private organisations investing in the development of a new technology. Investment partnerships are desirable and necessary because they reduce the risk to the GRDC in the funding of new technologies, and because partner organisations can bring benefits in addition to financial resources and research capacity, such as market knowledge, commercial expertise, infrastructure and access to complementary technologies.

Where the GRDC is a member of a research consortium using public and private sector funds, it has influence over the terms of

commercialisation, and determines these in collaboration with the other investors to ensure that a proper balance is struck among the needs of all members of the consortium.

The most usual path to market for commercial research products from GRDC research investment is through licensing to suitable commercial partners. Investments in joint ventures and companies to deliver the products are also considered, based on the merits of business cases that demonstrate that this delivers the best outcome for grain growers.

In selecting investment structures, the GRDC identifies and implements the structure which is most appropriate to maximise the benefits to growers from the GRDC's investment in R&D. The GRDC's position is that all commercial entities with which it has equity should be governed by appropriate boards that possess the broad range of skills required to provide oversight for the business.

The GRDC continues to deliver outputs from its research portfolio with the aim of providing benefit firstly to growers.

## Commercialisation outcomes

Every commercialisation task is unique, and the process of bringing products and technology to market must be undertaken on a project-by-project basis.

### New crop varieties

In 2014–15, the GRDC was actively involved in the commercialisation of several new crop varieties from breeding programs with financial support from the GRDC. The GRDC's primary objective was to encourage rapid adoption of the new, superior varieties by growers, while protecting the interests of the intellectual property owners.

In selecting commercial partners, the GRDC and its research partners take into consideration capabilities such as the ability to produce quality seed, the ability to market seed successfully, and the targets for seed production and variety uptake. The management and collection of end point royalties, including the terms and conditions imposed on growers, are also taken into consideration.



In the case of commercially bred crops such as wheat and canola, the GRDC has no ownership in new varieties and the responsibility for commercialisation lies with the breeding companies alone. The GRDC is an investor in some of the breeding companies.

In 2014–15, the new crop varieties commercialised comprised:

- one durum wheat variety
- two peanut varieties
- one chickpea variety.

## Commercial partnerships

In 2014–15, the GRDC entered into a strategic partnership with Bayer CropScience, the Herbicide Innovation Partnership, for the discovery and development of new technologies to manage resistant weeds and support the sustainability of Australian crop production systems.

In addition, research from the GRDC-funded Crop Biofactories Initiative came to fruition with the development of high-oleic acid producing safflower germplasm. The GRDC has granted CSIRO Agriculture the commercialisation rights to take this product to market.

The GRDC maintained existing investments in commercial R&D partnerships to develop new health products such as canola lines producing omega-3 fatty acids and wheat lines producing digestion-resistant starch.

## Intellectual property management

The GRDC usually owns a share of all intellectual property generated by research projects that it funds. This consists of registrable intellectual property (plant breeder's rights, patents and trademarks) and non-registrable intellectual property (copyright and trade secrets).

The corporation actively manages its intellectual property to:

- ensure that research outcomes are adopted as quickly and effectively as possible, by either dissemination or commercialisation
- provide access to GRDC intellectual property and gain access to third-party intellectual property where it will facilitate the delivery of research outcomes.

The GRDC seeks protection of its intellectual property where to do so will achieve the above objectives, and maintains a register of its registered intellectual property.

## Patents

During 2014–15, the GRDC reviewed its patent portfolio, looking at alignment to GRDC strategy and likelihood of delivery of the technology to growers within the remaining patent life. This review led to the abandonment of two patent families and the assignment of nine patent families to co-owners.

At 30 June 2015, the GRDC had an interest in 27 patent families composed of 23 patent families in which the GRDC is an applicant, one patent family where the GRDC has a beneficial interest, and three patents to which the GRDC has obtained a licence to practice the invention.

## Plant breeder's rights

The GRDC's plant breeder's rights (PBR) portfolio consists of 148 granted certificates of PBR and 20 applications for PBR across 21 different crop species.

In 2014–15, the GRDC and its research partners lodged four new PBR applications and surrendered nine certificates of PBR. Most of the activity in the GRDC PBR portfolio was related to the progression to grant of applications for new varieties released by the Pulse Breeding Australia chickpea, lentil and field pea programs.

## Trademarks

At 30 June 2015, the GRDC held 15 trademarks either in its own right or jointly.

## Business relationships

Many of the GRDC's business relationships are governed by research agreements, licence agreements to commercialise resulting intellectual property, and agreements which procure services. In some cases, the formation of companies and joint venture partnerships (for profit or not for profit) is the most effective way to deliver technologies, services, information and policy advice to Australian grain growers and the wider grains industry.

Table 21 describes the companies in which the GRDC had shares or membership at 30 June 2015. In most cases the GRDC also nominated one or more directors to the company's board.



**Table 21: Companies in which the GRDC had shares or membership at 30 June 2015**

Name	Activity	GRDC role
<b>Companies limited by guarantee</b>		
Agricultural Biotechnology Council of Australia Ltd ACN 103 817 296	Provides information about gene technology to enable informed debate.	Is a member of the company and provides research funding. Nominates a director.
Australian Crop Accreditation System Ltd ACN 093 984 902	Provides cereal variety details online for farmers and advisers, and manages National Variety Trials.	Is a member of the company and pays the company for services. Nominates a director.
Australian Export Grains Innovation Centre Limited ACN 160 912 032	Provides R&D related to the Australian export grains industry.	Is a member of the company. Nominates a director.
Grains & Legumes Nutrition Council Limited ACN 117 442 510	Identifies and communicates the health benefits of grain food products.	Is a member of the company and provides research funding. Nominates a director.
Invasive Animals Ltd ACN 114 965 276	Serves as the intellectual property (IP) holding/management company for the Invasive Animals Cooperative Research Centre.	Is a member of the company. Does not nominate a director.
Plant Biosecurity CRC ACN 115 589 707	Serves as the IP holding/management company for the Plant Biosecurity Cooperative Research Centre.	Is a member of the company. Does not nominate a director.
Wheat Quality Australia Limited ACN 147 439 656	Manages and delivers the wheat variety classification process.	Is a member of the company and pays the company for services. Nominates two directors.
<b>Companies limited by shares</b>		
Arista Cereal Technologies Pty Ltd ACN 122 450 962	Undertakes development and commercialisation of high-amylose wheat.	Is a 21% shareholder. Nominates a director.
Australian Centre for Plant Functional Genomics Pty Ltd ACN 102 769 808	Conducts functional genomics research into abiotic stress.	Is a 19% shareholder and provides research funding in return for equity.
Australian Grain Technologies Pty Ltd ACN 100 269 930	Undertakes commercial wheat and barley breeding.	Is a 39% shareholder. Nominates three directors.
Canola Breeders Western Australia Pty Ltd ACN 097 299 619	Undertakes commercial canola breeding focused on Western Australian low-rainfall areas with some adaptation to other regions of Australia.	Is a 39% shareholder.
InterGrain Pty Ltd ACN 128 106 945	Undertakes commercial wheat and barley breeding.	Is a 25% shareholder. Nominates one director.
Novozymes Biologicals Australia Pty Ltd ACN 119 069 617	Develops and markets inoculants products to benefit growers.	Is a 50% shareholder. Nominates up to two directors.





# PART 3—OUR ORGANISATION

Photo: Arthur Mostead

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# Board

The GRDC Board is responsible for the stewardship of the corporation, and oversees corporate governance within the GRDC. Its other functions include setting strategic direction and monitoring the ongoing performance of the business and of the Managing Director.

## Board members

At 30 June 2015, the Board comprised nine directors: Richard Clark (Chair), John Harvey (Managing Director), Andrew Barr, Jeremy Burdon,

Helen Garnett, Kim Halbert, Roseanne Healy, David Shannon and John Woods.

As illustrated in Figure 11, the Board has combined expertise in business management; commodity production, processing and marketing; economics; finance; management and conservation of natural resources; environmental and ecological matters; R&D administration; science and technology; technology transfer; communication; and public administration.

**Figure 11: Members of the Board in 2014–15**

Directors at 30 June 2015		
<p><b>Richard Clark</b> ADFM, FAICD Chair (Non-executive) <b>Appointed:</b> 1 October 2013, until 30 September 2016 <b>Member:</b> Remuneration Committee</p>		<p>Richard runs an intensive 1,340 hectare grain enterprise, focusing on summer and winter cereals, pulses, and oilseeds, at Tullooona, New South Wales.</p> <p>Richard is a graduate of the Orange Agricultural College and a fellow and graduate of the Australian Institute of Company Directors. He has extensive experience as a director and chairman of organisations in the agricultural sector and the grains industry in particular.</p> <p>Richard's experience includes the positions of founding Chair of the New South Wales Farmers' Association Grains Research Committee and Chairman of the Wheat Research Foundation of New South Wales. He has served as a director of Advantage Wheats, ChemCert, the Grain Foods Cooperative Research Centre and Quality Farms Australia, and was a director of the GRDC from 1996 until 2002.</p>
<p><b>John Harvey</b> BRurSc, GDRE, GCBA, GAICD Managing Director <b>Appointed:</b> 1 March 2011</p>		<p>John is a graduate member of the Australian Institute of Company Directors. He is a director of the Australian Crop Accreditation System and was a director of the Value Added Wheat Cooperative Research Centre.</p> <p>Before becoming Managing Director of the GRDC, John was on the management boards of Pulse Breeding Australia, Barley Breeding Australia and the National Soybean Breeding Program.</p> <p>John joined the GRDC in November 1997 as Program Manager Farming Systems. He became Manager R&amp;D Programs in 2001, Executive Manager Varieties in 2005 and Managing Director in March 2011. His background is in agricultural extension and research, development and extension (RD&amp;E) management. He previously worked with the Queensland Department of Primary Industries.</p>
<p><b>Andrew Barr</b> BAgSc, PhD, GAICD Director (Non-executive) <b>Appointed:</b> 4 November 2014, until 30 September 2017 <b>Member:</b> Finance, Risk and Audit Committee</p>		<p>As a plant breeder at the South Australian Research and Development Institute and the University of Adelaide, Andrew took part in releasing 25 varieties of oats and barley. He also taught plant breeding and genetics at undergraduate and postgraduate levels.</p> <p>Andrew has worked in international agriculture and food security, including with the International Center for Agricultural Research in the Dry Areas (ICARDA) and the International Maize and Wheat Improvement Center (CIMMYT).</p> <p>Andrew is an adjunct professor in the School of Agriculture, Food and Wine at the University of Adelaide and a director of the Australian Grain Growers Co-operative. He manages a broadacre cropping enterprise in the lower north of South Australia.</p>



**Figure 11: Members of the Board in 2014–15** (continued)

**Directors at 30 June 2015**

**Jeremy Burdon**

BSc (Hons), PhD,  
Hon DSc, FAA,  
FTSE, MAICD

Director (Non-executive)

**Appointed:**

4 November 2011,  
reappointed until  
30 September 2016

**Member:**

Commercialisation Committee  
Chair: Remuneration Committee



Jeremy has an international reputation in evolutionary biology, with particular expertise in epidemiology and genetics. His research has contributed in a wide range of areas, including cereal rust control, pre-breeding and the biological control of weeds.

From late 2003 to 2012, Jeremy led CSIRO Plant Industry, taking responsibility for the development of its scientific capability; the strategic direction of its work; and its financial health and staff training.

Since then he has continued his research interests in the development of approaches for the application of evolutionary principles to farming systems through an appointment as an Honorary Fellow in CSIRO.

He recently completed a six-year term on the Board of Trustees of Bioversity International and currently serves as the Chair of the Australian Academy of Science's National Committee for Agriculture, Fisheries and Food. In that role he is leading the production of a decadal plan for agricultural science.

**Helen Garnett**

PSM, BSc (Hons), PhD,  
FTSE, FAICD

Director (Non-executive)

**Appointed:**

4 November 2014,  
until 30 September 2017

**Member:**

Remuneration Committee



Helen is an accomplished director and leader, building on an earlier research career, including with industry, in pathogenesis and the development of diagnostics. She was awarded the Public Service Medal (2004) and the Centenary Medal (2000) for scientific and institutional leadership.

Helen is Chair of Delta Electricity and Chair of the Australian Centre for Plant Functional Genomics. She is a non-executive director of Carbon Energy Limited, ABM Resources NL, the National Centre for Vocational Education Research, the Crawford Fund and the Museum and Art Gallery of the Northern Territory.

Helen was previously Chair of the Australian Biosecurity Intelligence Network, a non-executive director of the Grape and Wine Research and Development Corporation, a director of Energy Resources of Australia Ltd, Vice Chancellor of Charles Darwin University, and Chief Executive of the Australian Nuclear Science and Technology Organisation.

**Kim Halbert**

BComm, GAICD

Deputy Chair  
(Non-executive)

**Appointed:**

4 November 2011,  
reappointed until  
30 September 2016

**Appointed as Deputy Chair:**

from 10 April 2012 until 3 November 2014,  
reappointed from 27 January 2015 until  
30 September 2016

**Chair:**

Finance, Risk and Audit Committee

**Member:**

Remuneration Committee



Since 1980, Kim has been a grain producer in the mid-west region of Western Australia, where he undertakes numerous production trials and engages in innovative farming practices.

He has experience in the management and conservation of natural resources, which he demonstrated in his role as a member of the management committee overseeing Natural Heritage Trust project funding for the Arrowsmith Catchment Group.

Kim has a strong interest in the marketing of grain, which is reflected in his participation on a number of boards, including Wheat Exports Australia. As a director of the Geraldton Port Authority, the second largest grain-exporting port in Australia, he consulted with grain marketers, bulk handlers and grower organisations.

**Roseanne Healy**

BA(Ec), MBA,  
MBR(Com), MAICD

Director (Non-executive)

**Appointed:**

4 November 2014,  
until 30 September 2017

**Member:**

Finance, Risk and Audit Committee



Roseanne is a non-executive director and corporate advisor. Formerly an economist and business analyst, Roseanne specialises in strategy, enterprise risk management and corporate governance.

Roseanne was previously a director of the Rural Industries Research and Development Corporation.

She is Chair of the Dairy Authority of South Australia and Chair of Frankston Regional Aquatic Centre Pty Ltd, and a non-executive director of HomeStart Finance, CUFA Ltd, GP partners Australia, Nyamba Buru Yawuru Ltd and Vinehealth Australia (formerly the Phyloxera and Grape Industry Board of South Australia). She is also Board Advisor to the Central Australian Aboriginal Congress Aboriginal Corporation.



**Figure 11: Members of the Board in 2014–15** (continued)

**Directors at 30 June 2015**

**David Shannon**  
B.Arch(Hons), NCFM  
(Durham), GAICD  
Director (Non-executive)  
**Appointed:**  
4 November 2014,  
until 30 September 2017



David is a grains and livestock producer with more than 30 years experience of farming in South Australia and Tasmania. In 1987, David was awarded an Australian Nuffield Scholarship to study grain legume production in Europe. David has held many chair and director positions in the agricultural industry. He spent 15 years on the GRDC's Southern Regional Panel, including eight years as Chair. David is the Independent Chairman of Mutooroo Pastoral Company.

**Member:**  
Commercialisation Committee

**John Woods**  
BAppSc  
Director (Non-executive)  
**Appointed:**  
8 March 2012,  
reappointed until  
30 September 2016



John owns and operates a cropping enterprise in northern New South Wales and southern Queensland, where he also participates in summer crop R&D trials and innovative new techniques. He has a strong interest in economic policy that affects agriculture, reflected in the positions he has held in industry and on community advisory bodies such as the National Rural Advisory Council, National Agricultural Monitoring System and Agricultural Finance Forum.

**Chair:**  
Commercialisation Committee

**Member:**  
Finance, Risk and Audit Committee

John also has experience in technology transfer and extension of R&D, which he demonstrated in his role as Chairman ChemCert Training Queensland, and as a ChemCert Trainer to the grains and cotton industries. The extension and adoption of best management practice was integral to his role as Queensland Manager Cotton Australia.

**Departed 3 November 2014**

**Richard Brimblecombe**  
MBA, MAICD  
Director (Non-executive)  
**Appointed:**  
4 November 2011,  
until 3 November 2014



Richard has held senior executive positions across a range of industries spanning financial services, commodity processing and marketing, rural services and renewable energy. As the former non-executive chairman and current Chief Executive Officer and managing director of Quantum Power, a company in the renewable energy sector, Richard has significant experience in the development, evaluation and execution of R&D strategy.

**Member:**  
Commercialisation Committee  
Finance, Risk and Audit Committee

**Chair:**  
Remuneration Committee

**Jenny Goddard**  
BComm (Hons)  
Director (Non-executive)  
**Appointed:**  
11 November 2008,  
reappointed until  
3 November 2014



Jenny works as a director and an economic and public policy consultant. She has 24 years of experience as an economic policy adviser to the Australian Government, including 11 years as a senior executive officer in the Department of the Prime Minister and Cabinet. Jenny was a commissioner with the Australian Fisheries Management Authority and the inaugural Chair of the Australian Solar Institute Board.

**Chair:**  
Finance, Risk and Audit Committee



**Figure 11: Members of the Board in 2014–15** (continued)

Directors at 30 June 2015		
Departed 3 November 2014		
<p><b>Robert Lewis</b> BSc (Hons), Hon DSc, PSM, FTSE Director (Non-executive) <b>Appointed:</b> 4 November 2011, until 3 November 2014</p>		<p>Robert was Chief Executive Officer/Executive Director of the South Australian Research and Development Institute for 18 years, a position from which he retired in June 2010.</p>
<p><b>Sharon Starick</b> BAGSc (Hons) Director (Non-executive) <b>Appointed:</b> 4 November 2011, until 3 November 2014 <b>Member:</b> Finance, Risk and Audit Committee</p>		<p>Sharon is a producer of grain and pigs in the Mallee region of South Australia, and has participated in Mallee Sustainable Farming and the South Australian No-Till Farmers Association.</p> <p>Sharon's memberships include the South Australian Natural Resources Management Council, the Australian Landcare Council, and the South Australian Murray–Darling Basin Natural Resources Management Board.</p>

## Board selection

Members of the GRDC Board are selected and appointed in accordance with the *Primary Industries Research and Development Act 1989* (PIRD Act). Under that Act, the Minister is responsible for the selection and appointment of the Chair of the GRDC Board. The Managing Director is selected by the Board, and holds office at the corporation's pleasure.

All other board members are selected by a selection committee, appointed by the Minister under the PIRD Act, in consultation with the industry representative organisation declared under the PIRD Act and other grower organisations. The selection committee is responsible for nominating five to seven candidates to be appointed as GRDC directors. Nominations are made to the Minister and formal appointment of directors is made by the Minister.

## Change of board membership

The terms of Richard Brimblecombe, Jenny Goddard, Robert Lewis and Sharon Starick finished on 3 November 2014.

On 4 November 2014, a new GRDC Board was appointed, until 30 September 2017. Four new members—Andrew Barr, Helen Garnett, Roseanne Healy and David Shannon—joined the continuing Chair, Richard Clark, and existing members Jeremy Burdon, Kim Halbert and John Woods, and the Managing Director, John Harvey.

On 10 July 2015, the Selection Committee's Presiding Member, Joanne Grainger, delivered the committee's annual report to the Minister. A copy of this report is at Appendix E.

## Corporate Secretary

Cathie Warburton, General Counsel, is the Corporate Secretary. The role of the Corporate Secretary is to:

- arrange the scheduling of board meetings, prepare draft agendas and coordinate the preparation of board papers
- prepare and circulate minutes of meetings and actions arising
- provide strategic and governance advice to the Board
- assist the Board in meeting its reporting obligations under section 19 of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act)
- maintain board records
- maintain an annual board calendar, prepared in conjunction with the Chair and management
- coordinate an induction program for new board members.

## Committees

At 30 June 2015, the Board had three committees, as described in Table 22. The Board receives formal reports from the committees, and any decisions that the Board makes in relation to those reports are recorded in the minutes of the subsequent board meeting.



**Table 22: Board committees**

Role	Membership
<b>Commercialisation Committee</b>	
<p>Reviews, evaluates and makes recommendations to the Board and management on matters relating to:</p> <ul style="list-style-type: none"> <li>the strategic oversight of the GRDC in regard to its planning processes related to the integration of research, development, commercialisation and adoption processes</li> <li>the commercial and R&amp;D interaction between the GRDC and the private sector, including R&amp;D partnerships, commercial structures and other joint ventures</li> <li>the development of draft policies regarding ownership of project intellectual property, risk sharing and licensing conditions with research and commercialisation partners to assist with the adoption of the results of R&amp;D</li> <li>corporate governance and risk management in the area of commercialisation and adoption of the results of R&amp;D, including oversight of the GRDC's role and investments in companies that undertake such commercialisation and adoption</li> <li>intellectual property management, protection and enforcement as necessary for the commercialisation of the results of R&amp;D.</li> </ul>	<p>Three non-executive directors appointed by the Board.</p>
<b>Finance, Risk and Audit Committee</b>	
<p>Assists the Board in fulfilling its corporate governance responsibilities and reviews the GRDC's:</p> <ul style="list-style-type: none"> <li>financial reporting process</li> <li>internal control system</li> <li>risk management strategy and processes</li> <li>internal and external audits</li> <li>process for monitoring compliance with laws and regulations and the Board's code of conduct</li> <li>financial statements.</li> </ul>	<p>At least three non-executive directors appointed by the Board.</p>
<b>Remuneration Committee</b>	
<p>Reviews and makes recommendations to the Board on matters relating to the remuneration and performance policy of the GRDC and the remuneration and performance of the Managing Director.</p>	<p>Chair, Deputy Chair and two other non-executive directors appointed by the Board.</p>

## Roles, responsibilities and code of conduct

The document 'Roles and Responsibilities of the Board' sets out the responsibilities and processes of the Board, including the code of conduct for directors. The Board reviews this document at least once a year.

### Induction and training

New board members participate in a formal induction process, and all board members undergo a process of continuous education.

### Disclosure of interests

Directors must comply with the GRDC's policy and procedures for conflict of interest and with legislative requirements regarding material personal interests. The Board reviews declarations of conflicts of interest at the start of each meeting and directors regularly update their conflict of interest declarations.

### Independent professional advice

With the Chair's approval, directors may obtain independent professional advice, at the GRDC's expense, on matters arising in the course of their Board and committee duties.

## Relationship with the Senior Leadership Group

The Senior Leadership Group has an advice and implementation role in relation to the Board. The group investigates and recommends matters for the Board to consider. It also implements the Board's decisions in accordance with approved policies and procedures, including an approval authority schedule that sets out the necessary delegations.



## Performance monitoring and review

At the start of each year the Board sets out priorities in a detailed plan for the corporation. The Board reviews the corporation's performance against the plan throughout the year. This is a key factor in determining the level of any performance bonuses paid to GRDC staff.

The Board periodically commissions an external review of its performance. The next review is scheduled for 2016.

## Meetings

During 2014–15, the Board held three meetings in Canberra and one meeting each in Melbourne, Perth and Toowoomba. Directors joined the regional panels on their spring tours in September 2014.

Each director's attendance at meetings during the year is set out in Table 23.

**Table 23: Attendance at board and committee meetings, 2014–15**

Members	Board		Finance, Risk and Audit Committee		Commercialisation Committee		Remuneration Committee	
	Meetings attended	Meetings held and eligible to attend	Meetings attended	Meetings held and eligible to attend	Meetings attended	Meetings held and eligible to attend	Meetings attended	Meetings held and eligible to attend
<b>Directors at 30 June 2015</b>								
Andrew Barr	4	4	3	3	–	–	–	–
Jeremy Burdon	6	6	–	–	3	3	3	3
Richard Clark	6	6	–	–	–	–	3	3
Helen Garnett	4	4	–	–	–	–	1	1
Kim Halbert	5	6	3	3	1	1	3	3
John Harvey	6	6	–	–	–	–	–	–
Roseanne Healy	4	4	3	3	–	–	–	–
David Shannon	2	4	–	–	2	2	–	–
John Woods	6	6	3	3	3	3	–	–
<b>Departed at 3 November 2014</b>								
Richard Brimblecombe	2	2	1	1	1	1	1	1
Jenny Goddard	2	2	1	1	–	–	–	–
Robert Lewis	2	2	1	1	–	–	–	–
Sharon Starick	2	2	1	1	–	–	–	–



# Advisory panels

The panel system is a key strength of the GRDC. The Board makes decisions with the support of the National Panel, which in turn is informed by the knowledge and experience of three regional panels. This network helps to ensure that GRDC investments are directed towards the interests of all its stakeholders and deliver benefits as relevant products and services in each grain-growing region. The efforts and expertise of this network of growers, advisers and researchers are crucial to the GRDC's success.

The Northern Regional Panel, Southern Regional Panel and Western Regional Panel represent Australia's three grain-growing regions. Each regional panel:

- identifies and monitors regional and national grains industry issues that are relevant to the region
- interacts with grower groups, Regional Cropping Solutions networks and other interested parties in the region to exchange information
- identifies and develops priorities for research, development and extension (RD&E) investment and recommends these to the National Panel
- keeps growers and advisers in the region informed about the GRDC's strategic direction, investment portfolio and research projects
- assists staff in monitoring the effectiveness of the investment portfolio.

The regional advisory panels are composed of grain growers, agribusiness representatives, researchers and the GRDC's executive managers, with provision for other industry experts to participate as appropriate. Panel members are contracted to carry out their roles and are not employees of the GRDC.

GRDC policies and procedures and panel member contracts cover the roles, responsibilities, code of conduct, conflict of interest, remuneration and selection guidelines for panel members.

The National Panel:

- addresses national RD&E priorities across the GRDC's investment portfolio and makes recommendations to the Board
- assists the Board to maintain links with grain growers, the Australian Government, state and territory governments and research partners.

The National Panel is composed of the three regional panel chairs and the GRDC's Managing Director and executive managers.

Panel members as at 30 June 2015 are listed in Table 24. Biographical information on panel members is available from the GRDC's website and YouTube channel.

**Table 24: Regional panel membership at 30 June 2015**

Chair	Deputy Chair	Members		
<b>Northern Regional Panel</b>				
James Clark	Loretta Serafin	Kelly Becker	Penny Heuston	John Sheppard
		Julianne Dixon	Tanya Howitt <sup>a</sup>	Rob Taylor
		Keith Harris	William Martel	Jack Williamson
<b>Southern Regional Panel</b>				
Keith Pengilley	Chris Blanchard	Neil Fettel	Richard Konzag	John Minogue
		Susan Findlay Tickner	Bill Long	Rob Sonogan
		Stuart Kearns <sup>a</sup>	Geoff McLeod	Mark Stanley
<b>Western Regional Panel</b>				
Peter Roberts	Mike Ewing	John Even	Darrin Lee	Sauna Stone
		Susan Hall	Brondwen MacLean <sup>a</sup>	Gemma Walker
		Paul Kelly	William Ryan	Chris Wilkins

<sup>a</sup> GRDC executive manager.



# Senior Leadership Group

The Senior Leadership Group (SLG) leads the GRDC's business activities, advises the GRDC Board and implements the Board's decisions. To ensure that the GRDC's operations are monitored and managed efficiently and effectively, the SLG meets regularly and maintains and updates an annual business schedule.

During 2014–15, the SLG had seven members: the Managing Director, the executive managers from each of the five business groups and the Chief Operating Officer.

The Chief Operating Officer is a temporary executive role established in March 2015 to lead a review of functional processes, procedures and systems, in order to sustain the GRDC in the future and optimise the delivery of benefits to grain growers and the wider community.

The management structure at 30 June 2015 is shown in Figure 9 in Part 1.

# Business groups

The GRDC's three operational business groups—Research Programs, Regional Grower Services, and Commercial—oversee and manage investments to achieve the outcomes determined under the GRDC's Strategic R&D Plan 2012–17. The operational business groups are supported by the enabling business groups, Corporate Services and Communications.

Table 25 provides details of the role of each group.



GRDC Senior Leadership Group

Back row (from left): Andreas Betzner (Acting Executive Manager Commercial), Tanya Howitt (Executive Manager Corporate Services), Kate Lord (Executive Manager Communications), Stuart Kearns (Executive Manager Regional Grower Services), Brondwyn MacLean (Executive Manager Research Programs)

Front row (from left): John Harvey (Managing Director), Steve Thomas (Chief Operating Officer)

Photo: Geoff Comfort

**Table 25: Business groups**

Mandate	Priorities	Functional areas
<b>Operational business groups</b>		
<b>Research Programs</b>		
<p>Create value for Australian grain growers by investing in R&amp;D programs that address key grains industry priorities, enhance competitiveness and sustainability and generate the greatest potential return for growers and the wider community.</p> <p>Ensure that R&amp;D programs are nationally coordinated and integrated with extension so that the Australian grains industry has access to a highly capable and effective research, development and extension (RD&amp;E) sector with the infrastructure and capability to meet future industry needs.</p>	<p>Design R&amp;D programs focused on addressing issues identified by stakeholders.</p> <p>Deliver R&amp;D outcomes that are adoptable and therefore have an impact at the farm level.</p> <p>Provide scientific advice to stakeholders to assist in the identification of issues.</p> <p>Provide national coordination and regional linkages that ensure that R&amp;D is focused and adoptable.</p> <p>Ensure that R&amp;D capability is maintained in core areas.</p>	<ul style="list-style-type: none"> <li>• Agronomy</li> <li>• Capacity building</li> <li>• Climate change</li> <li>• Crop protection</li> <li>• Farming systems</li> <li>• Gene discovery</li> <li>• Germplasm enhancement</li> <li>• Oilseeds, pulses and summer crop breeding</li> <li>• Resource management</li> <li>• Soils and environment</li> <li>• Statistics</li> <li>• Theme coordination</li> <li>• Trial operations</li> <li>• Winter cereal breeding</li> </ul>



**Table 25: Business groups (continued)**

Mandate	Priorities	Functional areas
<b>Regional Grower Services</b>		
Deliver the outputs of research in innovative products and services that meet the needs of growers and their advisers in each region.	<p>Understand growers' needs (listen to what is important).</p> <p>Develop new and improved grower-orientated products and services.</p> <p>Deliver high-value regionally relevant products and services to growers and advisers.</p> <p>Evaluate the performance and impact of GRDC products and services on growers' performance.</p>	<ul style="list-style-type: none"> <li>• Brand management</li> <li>• Information management and delivery</li> <li>• North, south and west communication and coordination</li> <li>• North, south and west regional program development</li> <li>• Publications</li> <li>• Technical/scientific communication</li> <li>• Webmaster services</li> </ul>
<b>Commercial</b>		
Access and develop innovation from Australia and overseas to ensure that it is commercialised in such a way that the overall benefit to Australian grain growers is optimised.	<p>Identify the opportunities provided within the GRDC R&amp;D portfolio to form more commercial partnerships to deliver benefits to the Australian industry.</p> <p>Expand the GRDC's global reach in order to increase the availability of technology to the Australian industry.</p> <p>Assess the value of the GRDC's commercially orientated investments.</p> <p>Ensure that the GRDC's investment in intellectual property and commercial enterprises continues to be focused on providing a return on investment.</p>	<ul style="list-style-type: none"> <li>• Commercial enterprises</li> <li>• Commercial farm technologies</li> <li>• Commercial grain technologies</li> </ul>
<b>Enabling business groups</b>		
<b>Corporate Services</b>		
<p>In the context of the GRDC delivering benefits to its stakeholders, provide:</p> <ul style="list-style-type: none"> <li>• the supporting services required for the GRDC to plan, conduct, report on and assess the effectiveness of its operations</li> <li>• processes to assist the operational business groups to achieve their objectives</li> <li>• support for effective governance of the GRDC by the Board.</li> </ul>	<p>Plan to satisfy corporation objectives.</p> <p>Establish business processes to optimally support all business groups in the GRDC.</p> <p>Provide services to the operational business groups (human resources, information technology, records management and evaluation).</p> <p>Report for risk and compliance purposes.</p> <p>Perform financial forecasting, reporting and budgeting.</p> <p>Provide legal advice to the corporation.</p> <p>Conduct performance evaluation, including impact assessment.</p> <p>Perform portfolio and business analysis.</p>	<ul style="list-style-type: none"> <li>• Business processes</li> <li>• Compliance</li> <li>• Finance</li> <li>• Human resources and industrial relations</li> <li>• Impact assessment</li> <li>• Information technology</li> <li>• Legal</li> <li>• Office management</li> <li>• Planning, strategy and reporting</li> <li>• Procurement</li> <li>• Records management</li> </ul>
<b>Communications</b>		
<p>Engage with key stakeholders to demonstrate that the GRDC is focused on grower profitability, partners and innovation to ensure that Australia's grains industry is profitable, sustainable and globally competitive.</p> <p>Deliver information through a range of channels, ensuring that information is timely and accessible and that the GRDC's values and brand are understood.</p>	<p>Provide editorial content through media engagement, social media, media partnerships, regional communicator activity and <i>Ground Cover</i>.</p> <p>Engage with stakeholders through editorial boards and media, government and industry briefings.</p> <p>Manage issues, through Senate estimates committees, reactive enquiries, social media and web content.</p> <p>Build the GRDC brand through branded events, conference sponsorship and brand management.</p>	<ul style="list-style-type: none"> <li>• Brand strategy</li> <li>• Crisis and issues management</li> <li>• Government and industry relations</li> <li>• Media relations</li> <li>• Social media</li> <li>• Web</li> </ul>



# Accountability

The GRDC is accountable to Australian grain growers and the Australian Government for its performance in addressing their identified priorities. The GRDC also meets its responsibilities under its governing legislation and the broader legal framework for corporate Commonwealth entities.

## Accountability to the Australian Government

### Responsible minister

During 2014–15, the GRDC was accountable to the Australian Parliament through the Minister for Agriculture, the Hon. Barnaby Joyce MP.



The Hon. Barnaby Joyce MP, Minister for Agriculture and Water Resources, at the signing of the Herbicide Innovation Partnership agreement. Photo: Jez Rozdarz

### Australian Government priorities

The GRDC's strategies and investments actively address the Australian Government's Strategic Research Priorities and Rural R&D Priorities. These priorities are discussed in detail in Part 1 and the GRDC's achievements in meeting them during 2014–15 are discussed in detail in Part 2.

The Science and Research Priorities announced by the government in May 2015 and the priorities set out in the Agricultural Competitiveness White Paper in July 2015 also inform the GRDC's decision making, and will be embedded in the GRDC's 2016–17 annual operational plan.

### Ministerial directions

The GRDC fully complies with relevant directions made by ministers under the PIRD Act, the PGPA Act or other Commonwealth legislation.

Under section 143 of the PIRD Act, the Minister may give written directions to the GRDC as to the performance of its functions and the exercise of its powers. No such directions were given in 2014–15.

Under section 22 of the PGPA Act, the Minister may give written directions to the GRDC regarding complying with the general policies of the government. No such directions were given in 2014–15.

### Funding agreement

On 1 June 2015, the GRDC signed a funding agreement with the Department of Agriculture in line with the requirements of the PIRD Act. The funding agreement sets out the terms and conditions under which money paid to the GRDC by the Commonwealth will be spent during the period from June 2015 to June 2019.

The GRDC has been developing a cost allocation model which will improve information and decision making on GRDC investments and improve transparency around achieving greatest value for money. The development of the model coincided with the requirement under the funding agreement to have developed and implemented a cost allocation policy.



The GRDC's new approach to investment planning will use the variables of productivity pathway, time to delivery, risk, scope and region, to balance the portfolio and, more importantly, to ensure that the GRDC is investing in the most appropriate RD&E activities to maximise the return to growers through the discovery and rapid and cost-effective adoption of new technology.

In short, the GRDC is working to ensure that:

- the most pressing issues and opportunities are accurately identified by growers and agronomists at the local level
- appropriate investigation into what is already known is undertaken
- gaps in current knowledge are identified
- the potential return to growers of addressing knowledge gaps is assessed
- relevant R&D is secured to fill the knowledge gaps
- information flows seamlessly from strategic research (investments over eight years or more) at the international and national levels, to applied R&D at the national and regional levels, and is always designed to minimise the complexity of adoption at the local level.

The GRDC also signed a separate funding deed with the Department of Agriculture on 20 October 2014. This agreement provides funding of \$3.46 million for the implementation of a voluntary reporting scheme for wheat stocks information that will also facilitate industry good activities as determined and agreed through an annual activity plan.

## Accountability to the grains industry

### Industry representative

Under the PIRD Act, the GRDC is made accountable to Australian grain growers through the industry's representative organisation. In 2014–15, Grain Producers Australia (GPA) was the representative organisation as declared by the Minister under section 7 of the PIRD Act. The GRDC also consults widely with a range of other grower organisations.

## Grains industry priorities

In setting directions for 2014–15 (the third year of the Strategic R&D Plan 2012–17), the GRDC identified industry priorities through direct consultations with GPA, local research advisory committees, grower groups, grower organisations and individual grain growers. The key industry priorities were incorporated into the GRDC Annual Operational Plan 2014–15.

The priorities are discussed in detail in Part 1 and the GRDC's achievements in meeting them during 2014–15 are discussed in detail in Part 2.

## Stakeholder reports

Each year the GRDC prepares a stakeholder report to assist the representative organisation to formulate advice to the Minister on setting the research levy rates which provide the basis for the corporation's income. The Stakeholder Report 2015–16 was provided to GPA in June 2015.

The GRDC also prepares a growers' report each year. This shortened form of the GRDC annual report provides a reader-friendly summary of how the GRDC operates, the corporation's financial situation, and highlights of research investments. The 2013–14 report was circulated to growers and other *Ground Cover* subscribers in January 2015.

## Industry levy rates

In 2014–15, a levy rate of 0.99 percent applied to all leviable crops covered by the GRDC, with the exception of maize, which was levied at 0.693 percent.

The levies were imposed and collected as stipulated by the:

- *Primary Industries (Excise) Levies Act 1999*, supported by the *Primary Industries (Excise) Levies Regulations 1999*, Schedules 4, 12, 20 and 25
- *Primary Industries Levies and Charges Collection Act 1991*, supported by the *Primary Industries Levies and Charges Collection Regulations 1991*, Schedules 8, 19, 29 and 34.

Proceeds from levies in 2014–15 are recorded in Note 4B of the Notes to the Financial Statements.

The GRDC paid the Department of Agriculture \$633,564 for the collection and management of levies in 2014–15.



## Consultation arrangements

The GRDC paid \$29,755 (plus GST) to GPA for industry consultation activities during 2014–15, in accordance with the government's *Guidelines on Funding of Consultation Costs by Primary*

*Industries and Energy Portfolio Statutory Authorities*. The GRDC did not fund any GPA project activities during the year.

Table 26 provides details of the GRDC's payments to GPA in 2014–15.

**Table 26: Payments to Grain Producers Australia for consultation (\$)**

Area of consultation	Activities undertaken by GPA	Amount <sup>a</sup>
Department of Agriculture oversight of the GRDC and industry	<p>Holding discussions with the department on various issues, including new requirements for a statutory funding agreement for the GRDC, and the relationships between statutory arrangements and the development of an industry-owned governance structure for the delivery of grains research, development and extension.</p> <p>Holding discussions with the department, the Department of Foreign Affairs and Trade and industry representative bodies on the International Grains Conference held in London in June 2015, the potential for trade alignment between Australian and United States wheat producers, and free trade arrangements.</p> <p>Holding discussions with the Department of Agriculture—Levies on issues related to the capture of levy income.</p>	881
GRDC engagement	<p>Presenting a report on national grains industry research, development and extension to the Australian Grains Industry Conference.</p> <p>Assisting and reimbursing attendance by key stakeholders at consultation meetings with the GRDC Board and senior managers.</p> <p>Assisting in preparation of the annual operational plan and stakeholder reports.</p> <p>Providing stakeholder feedback to the GRDC and reporting to industry on meeting outcomes.</p> <p>Contributing to technical meetings on the functions and activities of Wheat Quality Australia and the Grains Industry Market Access Forum, and to deliberations of the Australian Cereal Rust Control Program Consultative Committee.</p>	3,815
GRDC governance review	Working with industry to provide leadership on determining the best possible model for the GRDC's future structure.	25,059
	<b>Total</b>	<b>29,755</b>

GPA = Grain Producers Australia, GRDC = Grains Research and Development Corporation  
 a Excluding GST.

## Governing legislation

The legal framework for the GRDC's governance as a corporate Commonwealth entity in 2014–15 is outlined in Part 1 of this report.

## Independent audits

The Auditor-General is required to audit each Commonwealth entity's financial statements. In addition, the *Auditor-General Act 1997* confirms the power of the Auditor-General's office to carry out performance audits of Commonwealth entities and, in this role, to obtain documents and information.

The Auditor-General's Independent Audit Report on the GRDC's financial statements for 2014–15 is presented on pages 96–98.



## Judicial decisions and reviews by outside bodies

In 2014–15, the GRDC was not affected by judicial decisions or reviews by administrative tribunals, the Auditor-General, parliamentary committees, the Commonwealth Ombudsman or the Office of the Australian Information Commissioner.

## Significant events

The GRDC Board writes to the Minister after each board meeting, outlining all key decisions and actions taken at the meeting. This communication includes particulars of any significant decisions or issues as described in section 19 of the PGPA Act.

The Board advised the Minister of a number of significant decisions or issues during 2014–15, including:

- establishing a partnership with Bayer CropScience to develop innovative weed management solutions

- conducting an internal review of the GRDC's investment processes, system requirements and structure
- entering into a funding agreement with the Department of Agriculture for 2015–19.

The GRDC also advised the Minister of plans to establish a number of regional headquarters, each led by a senior executive charged with developing and implementing a regional strategy that coordinates investments for short (one year to three years) and medium (three years to eight years) timeframes. These changes will further strengthen the GRDC's substantial rural presence, and deliver better coordination and tailored benefits to growers at the regional and local levels. Under this plan, while achieving a significant transfer of focus and function to the regions, the GRDC will maintain a central office in Canberra to manage the more strategic research investments for the longer term (eight years or more), which serve all of Australia and are best managed centrally with strong international interactions and collaboration.



GRDC Board.

Back row (from left): Helen Garnett, Andrew Barr, John Woods, David Shannon, Jeremy Burdon and Roseanne Healy.

Front row (from left): John Harvey (Managing Director), Richard Clark (Chair) and Kym Halbert (Deputy Chair).

Photo: Geoff Comfort



# Corporate governance

The GRDC Board has overall responsibility for corporate governance within the organisation and places high value on continuously improving the GRDC's performance in this area.

Key activities during 2014–15 included:

- implementing governance and reporting arrangements under the PGPA Act
- evaluating strategic investment initiatives
- reviewing progress in achieving investment theme outcomes
- allocating resources to RD&E investments and assessing their effectiveness.

## Policies and procedures

In continuously improving the GRDC's corporate governance, the corporation is guided by the Australian National Audit Office's better practice guide *Public Sector Governance: Strengthening performance through good governance*.

The intranet is the key repository for information and guidance for GRDC staff and includes the corporation's:

- policies and procedures
- roles and responsibilities (including those of the Board and its committees)
- Code of Conduct
- delegations and authorisations schedule, which sets out delegations from the Board to management under the PIRD Act.

## Code of Conduct

The GRDC Code of Conduct sets out the principles and expected standards of behaviour for directors, staff and panel members. New directors and staff members are introduced to the code during induction, and presentations on the code are made to staff at regular intervals. All staff have access to the code via the policies section on the GRDC intranet.

## Risk management and fraud control

The GRDC continues to review and refine its risk management framework to reflect changes in the business environment and the GRDC's structure.

The GRDC prepares a regular business environment report to the Board. This report is used to update the GRDC's situation analysis and identify developing risks. The Board and the SLG conduct a detailed review of the GRDC's strategic risks at least every six months.

The GRDC conducts external assessments of its business risk and fraud risk every two years. External provider Sustineo completed an external business risks assessment in conjunction with GRDC management in November 2013. Also in conjunction with GRDC management, external provider Oakton completed an external fraud risk assessment, leading to staff training, in March 2014.

To ensure that the business and fraud risks are fully monitored and regularly updated, Corporate Services prepares a risk assessment register report and a fraud control action plan. The SLG, in consultation with managers, updates the report and action plan bimonthly. The Board reviews these documents at each meeting, as does the Finance, Risk and Audit Committee.

The SLG also conducts a full review of the risk assessment register and the fraud control action plan every six months. The risk assessment process was prepared in accordance with risk management standard AS/NZS ISO 3100:2009 Risk Management—Principles and Guidelines.

The GRDC's Managing Director is satisfied that:

- a fraud risk assessment and fraud control plan has been prepared that complies with the Commonwealth Fraud Control Framework
- appropriate fraud prevention, detection, investigation and reporting procedures and processes are in place
- fraud data that complies with the Commonwealth Fraud Control Framework is collected and reported to the Australian Institute of Criminology annually.



The GRDC is insured by Comcover, the Australian Government's self-managed fund for insurance risks. Each year the GRDC participates in Comcover's Risk Management Benchmarking Program. The March 2015 benchmarking survey rated the GRDC at 7.5 out of 10—the 'peer group' of 15 small agencies' average was 7 out of 10.

## Indemnities and insurance premiums for officers

The GRDC holds directors' and officers' liability insurance cover through Comcover. During the year, no indemnity-related claims were made. The cost of directors' and officers' indemnity insurance for 2014–15 was \$25,453.

## Environmental objectives

The principles of ecologically sustainable development (ESD) set out in the *Environment Protection and Biodiversity Conservation Act 1999* are embodied in the outcomes of the GRDC.

Achieving sustainable use and management of natural resources is one of the GRDC's core functions under the PIRD Act. It is also a key element of the Australian Government and grains industry priorities that shape the Strategic R&D Plan 2012–17, and the themes which underpin the GRDC's RD&E investment decisions.

In 2014–15, the GRDC supported many projects that contributed to ESD objectives, such as work to:

- improve productivity while reducing environmental impact, for example through tactical agronomy, tillage and stubble management, break crops, and varieties adapted for local conditions
- understand and preserve soil and water quality
- optimise biological diversity, for example in pest-suppressive landscapes and disease-suppressive soils
- foster the economic, environmental and social health of the grains industry, in the present and the longer term, through collaboration, education and knowledge sharing.

At the operational level, the GRDC is committed to managing its corporate activities with minimal impact on the environment. In 2013–14, this included reducing paper consumption by 19 percent per person through increased use of electronic systems and changes to certain paper-heavy processes. This continued in 2014–15 with the implementation of 'Follow Me' printing, reducing paper use by a further 18 percent per person. As part of a new communications room fit-out, the GRDC has elected to take advantage of a free cooling system which is expected to provide energy savings for server room cooling of up to 75 percent.

## Privacy

The GRDC's privacy policy was updated to incorporate the Australian Privacy Principles and reflect recent changes to government policy (including the removal of the requirement for a Personal Information Digest submission) in March 2014.

The policy aims to:

- clearly communicate the GRDC's personal information-handling practices
- enhance the transparency of the GRDC's operations
- give individuals a better and more complete understanding of the sort of personal information the GRDC holds, and the way it handles that information.

The policy is publicly available via the GRDC website.

## Freedom of information

Agencies subject to the *Freedom of Information Act 1982* are required to publish certain information about their governance and operations as part of the Information Publication Scheme. The GRDC's information under the Information Publication Scheme is available via the GRDC website, at [www.grdc.com.au/About-Us/Freedom-of-Information/Information-publication-scheme](http://www.grdc.com.au/About-Us/Freedom-of-Information/Information-publication-scheme).



# People management

The GRDC values its people and recognises that to be successful it must attract, develop and retain the right staff. Individual performance is monitored and rewarded, excellence is encouraged, and training and development needs are identified (as part of the performance review period), in order to meet the GRDC's goals and requirements now and in the future.

## Staff

At 30 June 2015, the GRDC had 59 full-time equivalent staff. Table 27 summarises the GRDC's average staffing level at 30 June 2015.

**Table 27: Personnel structure at 30 June 2015**

Type of employment	Male	Female	Total
Full-time permanent	30	29	59
Part-time permanent	0	1	1
Temporary	3	12	15
<b>Total</b>	<b>33</b>	<b>42</b>	<b>75</b>

## Structural change

On 15 June 2015, the GRDC commenced a major structural change process, following extensive external review, to ensure that the corporation is adding genuine value for growers and supporting a profitable and sustainable future for the Australian grains industry.

The new structure has a mix of new roles and new position descriptions and better alignment of teams and business groups.

The GRDC has recently focused on engaging and recruiting highly experienced staff nationally.

## Performance management

In 2014–15, the GRDC successfully implemented a performance review cycle within the performance management framework introduced in 2013–14. The framework successfully aligns performance outcomes to the GRDC's goals, objectives, values and leadership capabilities.

The GRDC encourages staff to undertake external education to enhance their skill set and professional development and continue their career growth. In 2014–15, several staff members attended formal study, short courses and conferences, and the GRDC proudly supported 19 employees who attended managerial and leadership training programs.

The GRDC also actively identified training and development gaps and opportunities in the annual training plan developed in January 2015.

Monthly staff briefings and regular face-to-face communications such as social club activities and team-building excursions helped to keep staff informed, involved, valued and cohesive in their commitment to and ownership of grains RD&E and GRDC initiatives.

## Work health and safety

The GRDC's work health and safety (WHS) mission is to create a workplace environment where the health, safety and wellbeing of employees are highly valued and people are encouraged and supported to adopt and maintain a healthy lifestyle. During 2014–15, the GRDC reviewed the established WHS programs as part of the framework developed in 2012 in compliance with the *Work Health and Safety Act 2011*.

The GRDC has designed a Workplace Health and Safety Management System based on:

- commitment, leadership and participation—including management commitment and leadership, worker participation, and policy
- planning—including hazard and risk identification and assessment, and defined WHS objectives and targets



- implementation—including hazard and risk control measures, emergency preparedness and response plans, identified competencies and related training, and documentation
- evaluation and corrective action—including monitoring and measurement (based on defined performance indicators), incident investigation and analysis, and preventive and corrective action
- management review and continual improvement.

During 2014–15, a new health and safety representative was appointed, regular WHS Committee meetings occurred, and WHS was successfully maintained as a standing agenda item at all business group meetings. The WHS Committee was encouraged to review all guidelines supporting the Workplace Health and Safety Management System, including reporting controls, measures and corrective actions, and the Safe Travel Guidelines.

Table 28 outlines measures that the GRDC implemented to promote a safe workplace for healthy staff in 2014–15.

**Table 28: Work health and safety performance**

Indicators	Performance
Health and wellbeing initiatives	The GRDC offered staff members flu vaccinations, fresh fruit (daily), and opportunities to participate in a yoga program. Counselling was made available for staff members and members of their families through the Employee Assistance Program.
Health and safety representative training and first aid training	A new health and safety representative was appointed. The GRDC's two health and safety representatives attended training. All first aid attendants were sent to full refresher training courses.
Training and awareness of work health and safety (WHS) requirements	In January 2015, mental health awareness training was delivered to over 95% of staff. Training on emergency procedures and health and safety induction was provided for all new staff.
Emergency evacuations	Two full site evacuations were conducted.
Internal security arrangements	The internal alarm system was tested and found to be working well.
Workplace facilities maintained to a high standard	Activities to ensure that facilities were well maintained included: <ul style="list-style-type: none"> <li>• twice yearly inspection of fire extinguishers</li> <li>• annual checking and restocking of the first aid kits</li> <li>• annual checking and tagging of electrical leads and power cords</li> <li>• regular inspections of smoke and heat detectors</li> <li>• regular cleaning of carpets.</li> </ul>
Statistics of any accidents or dangerous instances	Two minor incidents occurred. The GRDC internally investigated the incidents and determined that such incidents were unlikely to occur again. Minor control measures were put in place.
Investigations conducted, including notices given	The GRDC conducted no internal investigations. No notices were given to the GRDC under Part 10 of the <i>Work Health and Safety Act 2011</i> .



# FINANCIAL STATEMENTS

Photo: Paul Jones

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# Independent auditor's report



## INDEPENDENT AUDITOR'S REPORT

### To the Minister for Agriculture

I have audited the accompanying annual financial statements of the Grains Research and Development Corporation for the year ended 30 June 2015, which comprise:

- Statement by the Directors, Managing Director and Section Head Finance and Audit;
- Statement of Comprehensive Income;
- Statement of Financial Position;
- Statement of Changes in Equity;
- Cash Flow Statement;
- Schedule of Commitments; and
- Notes comprising a Summary of Significant Accounting Policies and other explanatory information.

### *Accountable Authority's Responsibility for the Financial Statements*

The Directors of the Grains Research and Development Corporation are responsible under the *Public Governance, Performance and Accountability Act 2013* for the preparation and fair presentation of annual financial statements that comply with Australian Accounting Standards and the rules made under that Act. The Directors are also responsible for such internal control as is necessary to enable the preparation and fair presentation of financial statements that are free from material misstatement, whether due to fraud or error.

### *Auditor's Responsibility*

My responsibility is to express an opinion on the financial statements based on my audit. I have conducted my audit in accordance with the Australian National Audit Office Auditing Standards, which incorporate the Australian Auditing Standards. These auditing standards require that I comply with relevant ethical requirements relating to audit engagements and plan and perform the audit to obtain reasonable assurance about whether the financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers internal control relevant to the entity's preparation and fair presentation of the financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of the accounting policies used and the

GPO Box 707 CANBERRA ACT 2601  
19 National Circuit BARTON ACT  
Phone (02) 6203 7300 Fax (02) 6203 7777



reasonableness of accounting estimates made by the Accountable Authority of the entity, as well as evaluating the overall presentation of the financial statements.

I believe that the audit evidence I have obtained is sufficient and appropriate to provide a basis for my audit opinion.

***Independence***

In conducting my audit, I have followed the independence requirements of the Australian National Audit Office, which incorporate the requirements of the Australian accounting profession.

***Opinion***

In my opinion, the financial statements of the Grains Research and Development Corporation:

- (a) comply with Australian Accounting Standards and the *Public Governance, Performance and Accountability (Financial Reporting) Rule 2015*; and
- (b) present fairly the financial positions of the Grains Research and Development Corporation as at 30 June 2015 and their financial performance and cash flows for the year then ended.

Australian National Audit Office



Carla Jago

Executive Director

Delegate of the Auditor General

Canberra

11 August 2015



# Statement by the directors, managing director and section head finance and audit

## GRAINS RESEARCH AND DEVELOPMENT CORPORATION

### STATEMENT BY THE DIRECTORS, MANAGING DIRECTOR AND SECTION HEAD FINANCE AND AUDIT

In our opinion, the attached financial statements for the year ended 30 June 2015 comply with subsection 42(2) of the *Public Governance, Performance and Accountability Act 2013* (PGPA Act), and are based on properly maintained financial records as per subsection 41(2) of the PGPA Act.

In our opinion, at the date of this statement, there are reasonable grounds to believe that the Corporation will be able to pay its debts as and when they fall due.

The statement is made in accordance with a resolution of the directors.

Signed..... 	Signed..... 	Signed..... 
Mr R M Clark CHAIRMAN	Mr J E Harvey MANAGING DIRECTOR	Mrs D K Jakubowski SECTION HEAD FINANCE AND AUDIT
11 August 2015	11 August 2015	11 August 2015



# Statement of comprehensive income

for the period ended 30 June 2015

	Notes	2015 \$'000	2014 \$'000
<b>NET COST OF SERVICES</b>			
<b>Expenses</b>			
Employee benefits	3A	10,741	9,557
Research and development	3B	194,107	165,369
Suppliers	3C	9,374	8,736
Depreciation and amortisation	3D	733	460
Write-down and impairment of assets	3E	1,040	293
<b>Total expenses</b>		<b>215,995</b>	184,415
<b>Own-source Income</b>			
<b>Own-source revenue</b>			
Interest	4A	2,134	2,074
Industry contributions	4B	117,466	120,250
Project refunds	4C	3,675	3,258
Royalties	4D	5,358	6,193
Grants income	4E	936	1,206
Other revenue	4F	508	363
<b>Total own-source revenue</b>		<b>130,077</b>	133,344
<b>Gains</b>			
Gain on disposal of investments	4G	54	1,716
Change in fair value through profit and loss	4G	5,019	5,480
<b>Total gains</b>		<b>5,073</b>	7,196
<b>Total own-source income</b>		<b>135,150</b>	140,540
<b>Net cost of services</b>		<b>80,845</b>	43,875
Revenue from Government	4H	67,986	68,605
Share of surplus/(deficit) of associates and joint ventures accounted for using the equity method	6C	29	(31)
<b>Surplus/(Deficit) attributable to the Australian Government</b>		<b>(12,830)</b>	24,699
<b>OTHER COMPREHENSIVE INCOME</b>			
<b>Items not subject to subsequent reclassification to net cost of services</b>			
Changes in asset revaluation surplus	7B	388	(1,537)
<b>Total other comprehensive income/(loss)</b>		<b>388</b>	(1,537)
<b>Total comprehensive income/(loss)</b>		<b>(12,442)</b>	23,162
<b>Total comprehensive income/(loss) attributable to the Australian Government</b>		<b>(12,442)</b>	23,162

The above statement should be read in conjunction with the accompanying notes.



# Statement of financial position

as at 30 June 2015

	Notes	2015 \$'000	2014 \$'000
<b>ASSETS</b>			
<b>Financial assets</b>			
Cash and cash equivalents	6A	82,534	72,381
Trade and other receivables	6B	26,097	9,414
Investments accounted for using the equity method	6C	-	431
Investments in managed funds	6D	150,891	145,872
Other Investments	6E	6,815	7,454
<b>Total financial assets</b>		<b>266,337</b>	<b>235,552</b>
<b>Non-financial assets</b>			
Land and buildings	7A, C	3,390	5,931
Property, plant and equipment	7B, C	924	212
Intangibles	7D, E	615	682
Other non-financial assets	7F	2,335	25,335
<b>Total non-financial assets</b>		<b>7,264</b>	<b>32,160</b>
Assets held for sale	8	4,760	-
<b>Total assets</b>		<b>278,361</b>	<b>267,712</b>
<b>LIABILITIES</b>			
<b>Payables</b>			
Suppliers	9A	2,049	2,251
Research and development	9B	77,232	57,302
Other payables	9C	3,464	-
<b>Total payables</b>		<b>82,745</b>	<b>59,553</b>
<b>Provisions</b>			
Employee provisions	10A	2,162	2,084
Other provisions	10B	2,119	2,298
<b>Total provisions</b>		<b>4,281</b>	<b>4,382</b>
<b>Total liabilities</b>		<b>87,026</b>	<b>63,935</b>
<b>Net assets</b>		<b>191,335</b>	<b>203,777</b>
<b>EQUITY</b>			
Retained surplus		80,221	96,901
Asset revaluation surplus		2,764	2,376
Capital commitment reserve		-	-
Contracted research reserve		108,350	104,500
<b>Total equity</b>		<b>191,335</b>	<b>203,777</b>

The above statement should be read in conjunction with the accompanying notes.





# Statement of changes in equity

for the period ended 30 June 2015

	Retained surplus		Asset revaluation surplus		Contracted research reserve		Capital commitment reserve		Total equity	
	2015	2014	2015	2014	2015	2014	2015	2014	2015	2014
	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000	\$'000
<b>Opening balance</b>										
Balance carried forward from previous period	96,901	85,726	2,376	3,913	104,500	89,826	-	1,150	203,777	180,615
<b>Adjusted opening balance</b>	<b>96,901</b>	85,726	<b>2,376</b>	3,913	<b>104,500</b>	89,826	-	1,150	<b>203,777</b>	180,615
<b>Comprehensive income</b>										
Other comprehensive income	-	-	388	(1,537)	-	-	-	-	388	(1,537)
Surplus/(Deficit) for the period	(12,830)	24,699	-	-	-	-	-	-	(12,830)	24,699
<b>Total comprehensive income</b>	<b>(12,830)</b>	24,699	<b>388</b>	(1,537)	-	-	-	-	<b>(12,442)</b>	23,162
Transfers between equity components	(3,850)	(13,524)	-	-	3,850	14,674	-	(1,150)	-	-
<b>Closing balance as at 30 June</b>	<b>80,221</b>	96,901	<b>2,764</b>	2,376	<b>108,350</b>	104,500	-	-	<b>191,335</b>	203,777

The above statement should be read in conjunction with the accompanying notes.

# Cash flow statement

for the period ended 30 June 2015

	Notes	2015 \$'000	2014 \$'000
<b>OPERATING ACTIVITIES</b>			
<b>Cash received</b>			
Industry contributions		117,530	120,155
Commonwealth contributions		72,889	68,029
Interest		7,979	7,713
Grants income		5,200	483
Other		13,289	5,667
Net GST received		15,330	20,235
<b>Total cash received</b>		<b>232,217</b>	<b>222,282</b>
<b>Cash used</b>			
Research and development		191,691	207,575
Employees		10,664	9,446
Suppliers		10,732	6,361
<b>Total cash used</b>		<b>213,087</b>	<b>223,382</b>
<b>Net cash from/(used by) operating activities</b>	11	<b>19,130</b>	<b>(1,100)</b>
<b>INVESTING ACTIVITIES</b>			
<b>Cash received</b>			
Investments		-	9,180
<b>Total cash received</b>		<b>-</b>	<b>9,180</b>
<b>Cash used</b>			
Purchase of property, plant and equipment		2,749	1,732
Investments		5,828	5,620
Shares		400	600
<b>Total cash used</b>		<b>8,977</b>	<b>7,952</b>
<b>Net cash from (used by) investing activities</b>		<b>(8,977)</b>	<b>1,228</b>
<b>Net increase (decrease) in cash held</b>		<b>10,153</b>	<b>128</b>
Cash and cash equivalents at the beginning of the reporting period		72,381	72,253
<b>Cash and cash equivalents at the end of the reporting period</b>	6A	<b>82,534</b>	<b>72,381</b>

The above statement should be read in conjunction with the accompanying notes.



# Schedule of commitments

as at 30 June 2015

	2015 \$'000	2014 \$'000
<b>BY TYPE</b>		
<b>Commitments receivable</b>		
Net GST recoverable on commitments	(39,408)	(37,420)
<b>Total commitments receivable</b>	<b>(39,408)</b>	<b>(37,420)</b>
<b>Commitments payable</b>		
<b>Capital commitments</b>		
Land and buildings <sup>1</sup>	-	2,404
<b>Total capital commitments</b>	<b>-</b>	<b>2,404</b>
<b>Other commitments</b>		
Operating leases <sup>2</sup>	10,025	11,430
Research projects forward program <sup>3</sup>	423,459	397,781
<b>Total other commitments</b>	<b>433,484</b>	<b>409,211</b>
<b>Total commitments payable</b>	<b>433,484</b>	<b>411,615</b>
<b>Net commitments by type</b>	<b>394,076</b>	<b>374,195</b>
<b>BY MATURITY</b>		
<b>Commitments receivable</b>		
Within 1 year	(14,196)	(14,133)
Between 1 to 5 years	(24,821)	(22,795)
More than 5 years	(391)	(492)
<b>Total commitments receivable</b>	<b>(39,408)</b>	<b>(37,420)</b>
<b>Commitments payable</b>		
<b>Capital commitments</b>		
Within 1 year	-	2,404
Between 1 to 5 years	-	-
<b>Total capital commitments</b>	<b>-</b>	<b>2,404</b>
<b>Research project commitments</b>		
Within 1 year	154,931	151,677
Between 1 to 5 years	268,528	246,104
More than 5 years	-	-
<b>Research projects commitments</b>	<b>423,459</b>	<b>397,781</b>
<b>Operating lease commitments</b>		
Within 1 year	1,227	1,377
Between 1 to 5 years	4,504	4,639
More than 5 years	4,294	5,414
<b>Total operating lease commitments</b>	<b>10,025</b>	<b>11,430</b>
<b>Total commitments payable</b>	<b>433,484</b>	<b>411,615</b>
<b>Net commitments by maturity</b>	<b>394,076</b>	<b>374,195</b>

Note: Commitments are GST inclusive where relevant.

- The nature of land and building commitments relates to leasehold improvements for office accommodation.
- Operating leases are effectively non-cancellable and comprise:

<i>Nature of the lease</i>	<i>General description of leasing arrangement</i>
Lease for office accommodation	Lease payments are subject to annual reviews in accordance with the lease agreement. The reviews are at a fixed percentage increase. The lease commenced on 1 May 2014 for a period of 10 years. There is an option to extend the lease term for 4 years. As part of the lease agreement, a cash incentive of \$1,785,525 (GST exclusive) was received, which has been applied as a rent-free period at the beginning of the lease term
Motor vehicles - staff	Leased as part of salary packages. No contingent rentals exist
Franking machine	A rental agreement for a period of 5 years exists for the franking machine, after this time it is usually replaced with new rental equipment

- Research project forward program commitments are amounts payable in respect of contracted Research Agreements held between the GRDC and research providers as at 30 June 2015.

The above schedule should be read in conjunction with the accompanying notes.



# Notes to and forming part of the financial statements

for the year ended 30 June 2015

## Note 1: Summary of Significant Accounting Policies

### 1.1 Objective of the GRDC

The Grains Research and Development Corporation (the Corporation) is an Australian Government controlled entity, established in 1990 as a statutory corporation under the *Primary Industries Research and Development Act 1989*. It is a not-for-profit entity. The primary objective of the Corporation is to support effective competition by Australian grain growers in global grain markets, through enhanced profitability and sustainability. By strategically investing in research and development (R&D) and the delivery of R&D outputs, the Corporation works to achieve one outcome:

Outcome 1 – New information and products that enhance the productivity, competitiveness and environmental sustainability of Australian grain growers and benefit the industry and wider community, through planning, managing and implementing investments in grains research and development.

The continued existence of the Corporation in its present form and with its present programs is dependent on Government policy.

### 1.2 Basis of Preparation of the Financial Statements

The financial statements are general purpose financial statements and are required by section 42 of the *Public Governance, Performance and Accountability Act 2013*.

The financial statements have been prepared in accordance with:

- a. Financial Reporting Rule (FRR) for reporting periods ending on or after 1 July 2014; and
- b. Australian Accounting Standards and Interpretations issued by the Australian Accounting Standards Board (AASB) that apply for the reporting period.

The financial statements have been prepared on an accrual basis and in accordance with historical cost convention, except for certain assets and liabilities at fair value. Except where stated, no allowance is made for the effect of changing prices on the results or the financial position.

The financial statements are presented in Australian dollars and values are rounded to the nearest thousand dollars unless otherwise specified.

Unless an alternative treatment is specifically required by an accounting standard or the FRR, assets and liabilities are recognised in the Statement of Financial Position when and only when it is probable that future economic benefits will flow to the Corporation or a future sacrifice of economic benefits will be required and the amounts of the assets or liabilities can be reliably measured. However, assets and liabilities arising under executory contracts are not recognised unless required by an accounting standard. Liabilities and assets that are unrecognised are reported in the Schedule of Commitments.

Unless alternative treatment is specifically required by an accounting standard, income and expenses are recognised in the Statement of Comprehensive Income when, and only when, the flow, consumption or loss of economic benefits has occurred and can be reliably measured.

### 1.3 Significant Accounting Judgements and Estimates

In the process of applying the accounting policies listed in this note, the Corporation has made the following estimates that have the most significant impact on the amounts recorded in the financial statements:

- a. The valuation of unlisted shares held by the Corporation (as detailed in note 1.12) at each reporting date is equivalent to the Corporation's share of net assets of each company.

No other accounting assumptions or estimates have been identified that have a significant risk of causing material adjustment to carrying amounts of assets and liabilities within the next reporting period.

### 1.4 New Australian Accounting Standards

#### **Adoption of new Australian Accounting Standard Requirements**

No accounting standard has been adopted earlier than the application date as stated in the standard.

The following new standards, revised standards, interpretations and amendments to standards were issued prior to the sign-off date, were applicable to the current reporting period and had an effect on the Corporation's financial statements:



## Note 1: Summary of Significant Accounting Policies *(continued)*

### 1.4 New Australian Accounting Standards *(continued)*

Standard/Interpretation		Nature of change in accounting policy, transitional provisions <sup>1</sup> and adjustment to financial statements
AASB 11	Joint Arrangements	Supersedes AASB 131 and Interpretation 113. AASB 11 adopts the broader control concept introduced by AASB 10 which may affect the consolidation of some joint venture arrangements.  Minimal impact on GRDC.
AASB 12	Disclosure of Interests in Other Entities	Requires that an entity disclose the significant judgements and assumptions used in determining whether it has control, significant influence or joint control.  Minimal impact on GRDC.
AASB 128	Investments in Associates and Joint Ventures	Changes include: <ol style="list-style-type: none"> <li>the scope is broadened to include joint ventures accounted for using the equity method;</li> <li>scope exclusion for venture capital organisations and mutual funds is relocated to measurement exclusion; and</li> <li>general working and layout changes.</li> </ol> Minimal impact on GRDC.
AASB 2011-7	Amendments to Australian Accounting Standards arising from the Consolidation and Joint Arrangements Standards	These changes ensure other standards remain consistent with the new standards AASB 10, 11, 12 as well as the revised AASB 127 and 128.
AASB 1055	Budgetary Reporting	Sets out the budgetary disclosure requirements for whole-of-government financial statements, each government's General Sector (GGS) financial statements and financial statements for each not-for profit entity within the GGS.  New disclosures for GRDC.
AASB 2013-1	Amendments to AASB 1049 – Relocation of Budgetary Reporting Requirements	Removes requirements for the disclosure of budgetary information for whole-of-government and each government's GGS from AASB 1049 as these are now included in AASB 1055.
AASB 1031	Materiality	Reissued as a result of AASB's decision to gradually withdraw the accounting standard on materiality. No longer includes a definition of 'material' or guidance on how to assess materiality. Instead, it references AASB 108, 101 and the Framework.
AASB 2012-3	Amendments to Australian Accounting Standards – Offsetting Financial Assets and Financial Liabilities	Adds application guidance to AASB 132 <i>Financial Instruments: Presentation</i> .
AASB 2013-3	Amendments to AASB 136 – Recoverable Amount Disclosures for Non-Financial Assets	Amends AASB 136 <i>Impairment of Assets</i> to require the entity to disclose for each impaired asset or cash-generating unit whether the recoverable amount disclosed is fair value less cost of disposal or value in use.
AASB 2013-8	Amendments to Australian Accounting Standards – Australian Implementation Guidance for Not-for-Profit Entities – Control and Structured Entities	Adds an Australian Implementation Guidance appendix to AASB 10 to explain and illustrate how the control criteria of AASB 10 should be applied in the Australian context by not-for-profit private and public sector entities.
AASB 2014-1	Amendments to Australian Accounting Standards	Makes a range of amendments to Australian Accounting Standards.

<sup>1</sup> When transitional provisions apply, all changes in accounting policy are made in accordance with their respective transitional provisions.

All other new standards, revised standards, interpretations and amendments to standards that were issued prior to the sign-off date and are applicable to the current reporting period did not have a material effect, and are not expected to have a future material effect, on the Corporation's financial statements.



## Note 1: Summary of Significant Accounting Policies (continued)

### 1.4 New Australian Accounting Standards (continued)

#### Future Australian Accounting Standard Requirements

The following new standards, revised standards, interpretations and amendments to standards were issued by the Australian Accounting Standards Board prior to the sign-off date, which are expected to have an impact on the Corporation's financial statements for future reporting periods:

Standard/Interpretation	Application Date <sup>1</sup>	Nature of impending change in accounting policy and likely impact on initial application
AASB 2010-7 Amendments to Australian Accounting Standards arising from AASB 9 (December 2010)	2016	Makes changes to a number of Standards and Interpretations resulting from the re-issuance of AASB 9 <i>Financial Instruments</i> in December 2010.
AASB 2013-9 Amendments to Australian Accounting Standards – Conceptual Framework, Materiality and Financial Instruments	2016	Makes changes to AASB 9 <i>Financial Instruments</i> to incorporate the latest amendments to IFRS 9, updates references to the Conceptual Framework and deletes references to AASB 1031 <i>Materiality</i> in other standards. The main changes are including a new chapter on Hedge Accounting and deferring the mandatory effective date of AASB 9 from 1 January 2015 to 1 January 2017.
AASB 9 Financial Instruments	2018	AASB 9 (re-issued in December 2010) represents the first phase of a three phase process to replace AASB 139 <i>Financial Statements and Recognition</i> .

<sup>1</sup> The Corporation's expected initial application date is when the accounting standard becomes operative at the beginning of the Corporation's reporting period.

All other new standards, revised standards, interpretations and amendments to standards that were issued prior to the sign-off date and are applicable to future reporting periods are not expected to have a future material impact on the Corporation's financial statements.

### 1.5 Revenue

Revenue from the sale of goods is recognised when:

- the risks and rewards of ownership have been transferred to the buyer;
- the entity retains no managerial involvement or effective control over the goods;
- the revenue and transaction costs incurred can be reliably measured; and
- it is probable that the economic benefits associated with the transaction will flow to the entity.

Revenue from rendering of services is recognised by reference to the stage of completion of contracts at the reporting date. The revenue is recognised when:

- the amount of revenue, stage of completion and transaction costs incurred can be reliably measured; and
- the probable economic benefits associated with the transaction will flow to the entity.

The revenues described in this note are revenues relating to the core activities of the Corporation.

#### Revenue from Government

Revenue paid to the Corporation under Section 32 of the *Primary Industries Research and Development Act 1989*, representing 0.5% of the three-year moving average of gross value of production of grains, is for the purpose of funding research and development activities. Revenues from Government are recognised when they are entitled to be received by the Corporation.

Funding received or receivable from non-corporate Commonwealth entities (appropriated to the non-corporate Commonwealth entity as a corporate Commonwealth entity payment item for payment to the Corporation) is recognised as Revenue from Government by the Corporation unless the funding is in the nature of an equity injection or loan.

#### Industry contributions

Revenue paid to the Corporation under Section 30 of the *Primary Industries Research and Development Act 1989*, where a research levy is attached to grain producers' output, is for the purpose of providing funds for research and development. Industry contributions are recognised when they are entitled to be received by the Corporation.

#### Interest revenue

Interest revenue is recognised using the effective interest method as set out in AASB 139 *Financial Instruments: Recognition and Measurement*.



## Note 1: Summary of Significant Accounting Policies *(continued)*

### 1.5 Revenue *(continued)*

#### **Project refunds**

Project refunds are recognised upon receipt of the refund when it relates to prior years expenditure and when the funds accrued are not required for the completion of the project.

#### **Royalties**

Royalties are recognised when the royalty is entitled to be received by the Corporation and when it can be reliably measured.

#### **Grants income**

Grants income is revenue paid to the Corporation for the purpose of funding specific research and development projects. Grants and other non-reciprocal contributions from non-government entities are recognised as revenue when the Corporation obtains control over the assets comprising the contributions. Control is normally obtained upon receipt. Grants from government entities are recognised on a systematic basis over the periods in which the Corporation recognises as expenses the related costs for which the grants are intended.

### 1.6 Gains

#### **Sale of assets**

Gains from the disposal of assets are recognised when control of the asset has passed to the buyer.

#### **Gain - Investments**

Gains from a change in the accounting treatment of share investments are recognised at the time the change is required to be made (for example, at the time significant influence is lost).

### 1.7 Employee Benefits

Liabilities for 'short-term employee benefits' (as defined in AASB 119 *Employee Benefits*) and termination benefits due within twelve months of the end of the reporting period are measured at their nominal amounts.

The nominal amount is calculated with regard to the rates expected to be paid on settlement of the liability.

Other long-term benefits are measured as net total of the present value of the defined benefit obligation at the end of the reporting period minus the fair value at the end of the reporting period of plan assets (if any) out of which the obligations are to be settled directly.

#### **Leave**

The liability for employee benefits includes provision for annual leave and long service leave. No provision has been made for sick leave as all sick leave is non-vesting and the average sick leave taken in future years by employees of the Corporation is estimated to be less than the annual entitlement for sick leave.

The leave liabilities are calculated on the basis of employees' remuneration at the estimated salary rates that applied at the time the leave is taken, including the Corporation's employer superannuation contribution rates, to the extent that the leave is likely to be taken during service rather than paid out on termination.

The liability for long service leave has been determined by using the Australian Government shorthand method. In applying this method, the accrued long service leave for each employee as at reporting date is probability weighted, based on the Australian Government probability profile. The amount obtained for each employee is then discounted using the ten year Treasury Bond rate. The total estimated liability for the Corporation is the sum of the liabilities for each employee. The estimate of the present value of the liability takes into account attrition rates and pay increases through promotion and inflation.

#### **Separation and redundancy**

Provision is made for separation and redundancy benefit payments. The Corporation recognises a provision for termination when it has developed a detailed formal plan for the terminations and has informed those employees affected that it will carry out the terminations.

#### **Superannuation**

The Corporation's staff are members of the Commonwealth Superannuation Scheme (CSS), the Public Sector Superannuation Scheme (PSS), the PSS Accumulation Plan (PSSap), AustralianSuper or an approved superannuation scheme of their choice.

The CSS and PSS are defined benefit schemes for the Australian Government. The PSSap is a defined contribution scheme.

The liability for defined benefits is recognised in the financial statements of the Australian Government and is settled by the Australian Government in due course. This liability is reported in the Department of Finance's administered schedules and notes.

For CSS and PSS members, the Corporation makes contributions based on the rates determined by an actuary to be sufficient to meet the current costs to the Government. The Corporation accounts for the contributions as if they were contributions to defined contribution plans.

For AustralianSuper and other approved superannuation schemes, the Corporation contributes a minimum of 9.5% of superannuable salaries.

As at 30 June, superannuation contributions payable were \$NIL (2014: \$NIL).



## Note 1: Summary of Significant Accounting Policies *(continued)*

### 1.8 Leases

A distinction is made between finance leases and operating leases. Finance leases effectively transfer from the lessor to the lessee substantially all the risks and rewards incidental to ownership of leased assets. An operating lease is a lease that is not a finance lease. In operating leases, the lessor effectively retains substantially all such risks and benefits.

The Corporation has no finance leases. Operating lease payments are expensed on a straight-line basis which is representative of the pattern of benefits derived from the leased assets.

### 1.9 Research and Development (R&D) Contracts

The Corporation recognises project liabilities through project agreements that require the research partner to perform services, provide facilities, or to meet required specifications or eligibility criteria. In these cases, the initial payment is recognised as a liability and expense when the specifications or eligibility criteria have been agreed by the research partner to the Corporation's satisfaction. The remaining payments are recognised to the extent that the services required have been performed.

### 1.10 Fair Value Measurement

The Corporation deems transfers between levels of the fair value hierarchy to have occurred at the end of the reporting period.

### 1.11 Cash

Cash is recognised at its nominal amount. Cash and cash equivalents include:

- cash on hand; and
- demand deposits in bank accounts with an original maturity of 3 months or less that are readily convertible to known amounts of cash and subject to insignificant risk of changes in value.

### 1.12 Financial Assets

The Corporation classifies its financial assets in the following categories:

- a. financial assets at fair value through profit or loss;
- b. held-to-maturity investments;
- c. available-for-sale financial assets; and
- d. loans and receivables.

The classification depends on the nature and purpose of the financial assets and is determined at the time of initial recognition. Financial assets are recognised and derecognised upon trade date.

#### ***Effective interest method***

The effective interest method is a method of calculating the amortised cost of a financial asset and of allocating interest income over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash receipts through the expected life of the financial asset, or, where appropriate, a shorter period.

Income is recognised on an effective interest rate basis except for financial assets at fair value through profit or loss.

#### ***Financial assets at fair value through profit or loss***

Financial assets are classified as financial assets at fair value through profit or loss where the financial assets:

- a. have been acquired principally for the purpose of selling in the near future;
- b. are derivatives that are not designated and effective as a hedging instrument; or
- c. are parts of an identified portfolio of financial instruments that the Corporation manages together and has a recent actual pattern of short-term profit-taking.

Assets in this category are classified as current assets.

Financial assets at fair value through profit or loss are stated at fair value, with any resultant gain or loss recognised in profit or loss. The net gain or loss recognised in profit or loss incorporates any interest earned on the financial asset. Interest earned on financial assets at fair value through profit and loss is included in line item 'Change in fair value through profit and loss' note 4G.

#### ***Available-for-sale financial assets***

Available-for-sale financial assets are non-derivatives that are either designated in this category or not classified in any of the other categories.



## Note 1: Summary of Significant Accounting Policies *(continued)*

### 1.12 Financial Assets *(continued)*

Available-for-sale financial assets are recorded at fair value. Gains and losses arising from changes in fair value are recognised directly in reserves (equity) with the exception of impairment losses. Interest is calculated using the effective interest method and foreign exchange gains and losses on monetary assets are recognised directly in profit or loss. Where the asset is disposed of or is determined to be impaired, part (or all) of the cumulative gain or loss previously recognised in the reserve is included in surplus or deficit for the period.

Where a reliable fair value cannot be established for unlisted investments in equity instruments, these instruments are valued at cost. The Corporation holds shares in the following unlisted companies:

- Australian Grain Technologies Pty Ltd (holding: 39%);
- Australian Centre for Plant Functional Genomics Pty Ltd (holding: 19%);
- Arista Cereal Technologies Pty Ltd (holding: 21%);
- InterGrain Pty Ltd (holding: 25%).

The above companies conduct research and development activities relating to seed technology, new wheat varieties and high amylose wheat. The success and ability to generate future economic benefits are subject to uncertainty and the Corporation believes that this will impair the carrying values of the investments.

The Corporation has established a *provision for diminution in share value* to record a reduction in the value of each of these investments based on the Corporation's estimate of the trading performance of each company. A review of the trading performances will be performed annually and the provisions adjusted accordingly. The provision for each investment is disclosed at note 6E. The provision will remain effective until such time as the Corporation believes that the investment would generate sufficient future economic benefits from a successfully marketed product or service and an active market for the investment exists. The investment would then be measured at fair value.

#### ***Held-to-maturity investments***

Non-derivative financial assets with fixed or determinable payments and fixed maturity dates that the Corporation has the positive intent and ability to hold to maturity are classified as held-to-maturity investments. Held-to-maturity investments are recorded at amortised cost using the effective interest method less impairment, with revenue recognised on an effective yield basis.

#### ***Loans and receivables***

Trade receivables, loans and other receivables that have fixed or determinable payments that are not quoted in an active market are classified as 'loans and receivables'. Loans and receivables are measured at amortised cost using the effective interest method less impairment. Interest is recognised by applying the effective interest rate.

#### ***Impairment of financial assets***

Financial assets are assessed for impairment at the end of each reporting period.

*Financial assets carried at amortised cost* – if there is objective evidence that an impairment loss has been incurred for loans and receivables or held-to-maturity investments held at amortised cost, the amount of the loss is measured as the difference between the asset's carrying amount and the present value of estimated future cash flows discounted at the asset's original effective interest rate. The carrying amount is reduced by way of an allowance account. The loss is recognised in the Statement of Comprehensive Income.

*Available-for-sale financial assets* – if there is objective evidence that an impairment loss on an available-for-sale financial asset has been incurred, the amount of the difference between its cost, less principal repayments and amortisation, and its current fair value, less any impairment loss previously recognised in expenses, is transferred from equity to the Statement of Comprehensive Income.

*Financial assets carried at cost* – if there is objective evidence that an impairment loss has been incurred, the amount of the impairment loss is the difference between the carrying amount of the asset and the present value of the estimated future cash flows discounted at the current market rate for similar assets.

### 1.13 Investments in Associates

The Corporation's investments in its associates are accounted for using the equity method.

Under the equity method, investments in associates are carried in the Corporation's Statement of Financial Position at cost as adjusted for post-acquisition changes in the Corporation's share of net assets of the associates. Goodwill relating to an associate is included in the carrying amount of the investment. After the application of the equity method, the Corporation determines whether it is necessary to recognise any impairment loss with respect to the net investment in associates.



## Note 1: Summary of Significant Accounting Policies *(continued)*

### 1.14 Financial Liabilities

Financial liabilities are classified as either financial liabilities at 'fair value through profit or loss' or other financial liabilities. Financial liabilities are recognised and derecognised upon 'trade date'.

#### ***Financial liabilities at fair value through profit or loss***

Financial liabilities at fair value through profit or loss are initially measured at fair value. Subsequent fair value adjustments are recognised in profit or loss. The net gain or loss recognised in profit or loss incorporates any interest paid on the financial liability.

#### ***Other financial liabilities***

Other financial liabilities, including borrowings, are initially measured at fair value, net of transaction costs. These liabilities are subsequently measured at amortised cost using the effective interest method, with interest expense recognised on an effective yield basis.

The effective interest method is a method of calculating the amortised cost of a financial liability and of allocating interest expense over the relevant period. The effective interest rate is the rate that exactly discounts estimated future cash payments through the expected life of the financial liability, or, where appropriate, a shorter period.

Supplier and other payables are recognised at amortised cost. Liabilities are recognised to the extent that the goods or services have been received (and irrespective of having been invoiced).

### 1.15 Contingent Liabilities and Contingent Assets

Contingent liabilities and contingent assets are not recognised in the Statement of Financial Position but are reported in the relevant schedules and notes. They may arise from uncertainty as to the existence of a liability or asset, or represent an asset or liability in respect of which the amount cannot be reliably measured. Contingent assets are disclosed when settlement is probable but not virtually certain and contingent liabilities are disclosed when settlement is greater than remote.

As at 30 June 2015 the Corporation held no contingent liabilities or contingent assets.

### 1.16 Acquisition of Assets

Assets are recorded at cost on acquisition except as stated below. The cost of acquisition includes the fair value of assets transferred in exchange and liabilities undertaken. Financial assets (with the exception of investments in equity instruments that do not have a quoted market price in an active market and whose fair value cannot be reliably measured) are initially measured at their fair value plus transaction costs where appropriate.

Assets acquired at no cost, or for nominal consideration, are initially recognised as assets and income at their fair value at the date of acquisition.

### 1.17 Property, Plant and Equipment

#### ***Asset recognition threshold***

Purchases of property, plant and equipment are recognised initially at cost in the Statement of Financial Position, except for purchases costing less than \$2,000, which are expensed in the year of acquisition (other than where they form part of a group of similar items which are significant in total).

The initial cost of an asset includes an estimate of the cost of dismantling and removing the item and restoring the site on which it is located. This is particularly relevant to 'make good' provisions in property leases taken up by the Corporation where there exists an obligation to restore the property to its original condition. These costs are included in the value of the Corporation's leasehold improvements with a corresponding provision for the 'make good' recognised.

#### ***Revaluations***

Following initial recognition at cost, property, plant and equipment are carried at fair value less subsequent accumulated depreciation and accumulated impairment losses. Valuations are conducted with sufficient frequency to ensure that the carrying amounts of assets do not differ materially from the assets' fair values as at the reporting date. The regularity of independent valuations depend upon the volatility of movements in market values for the relevant assets.

Revaluation adjustments are made on a class basis. Any revaluation increment was credited to equity under the heading of asset revaluation reserve except to the extent that it reversed a previous revaluation decrement of the same asset class that was previously recognised in the surplus/deficit. Revaluation decrements for a class of assets were recognised directly in the surplus/deficit except to the extent that they reversed a previous revaluation increment for that class.

Any accumulated depreciation as at the revaluation date was eliminated against the gross carrying amount of the asset and the asset was restated to the revalued amount.



## Note 1: Summary of Significant Accounting Policies *(continued)*

### 1.17 Property, Plant and Equipment *(continued)*

#### **Depreciation**

Depreciable property, plant and equipment assets are written-off to their estimated residual values over their estimated useful lives to the Corporation using, in all cases, the straight-line method of depreciation.

Depreciation rates (useful lives), residual values and methods are reviewed at each reporting date and necessary adjustments are recognised in the current, or current and future reporting periods, as appropriate.

Depreciation rates applying to each class of depreciable asset are based on the following useful lives:

	2015	2014
Buildings on leasehold land	25 years	25 years
Other infrastructure, plant & equipment	3 to 12 years	3 to 12 years

#### **Assets purchased with research payments**

Assets purchased with research payments may revert to the Corporation at the end of the research project period and will be accounted for appropriately at that date. During the financial year no research assets reverted to the Corporation (2014: \$NIL).

#### **Impairment**

All assets were assessed for impairment at 30 June 2015. Where indications of impairment exist, the asset's recoverable amount is estimated and an impairment adjustment made if the asset's recoverable amount is less than its carrying amount.

The recoverable amount of an asset is the higher of its fair value less costs to disposal and its value in use. Value in use is the present value of the future cash flows expected to be derived from the asset. Where the future economic benefit of an asset is not primarily dependent on the asset's ability to generate future cash flows, and the asset would be replaced if the Corporation were deprived of the asset, its value in use is taken to be its depreciated replacement cost.

#### **Derecognition**

An item of property, plant and equipment is derecognised upon disposal or when no further economic benefits are expected from its use or disposal.

### 1.18 Intangibles

The Corporation's intangibles comprise internally developed software for internal use.

Software is carried at cost less accumulated amortisation and accumulated impairment losses. Software is amortised on a straight-line basis over its anticipated useful life as follows:

	2015	2014
Information management system	2.5 years	2.5 years
Other software	4 years	4 years

All software assets were assessed for indications of impairments as at 30 June 2015.

#### **Development costs**

Research costs are expensed when incurred. An intangible asset arising from development expenditure is only recognised when technical feasibility studies identify that the expenditure will deliver future economic benefits and these benefits can be measured reliably. Other development expenditure is recognised in the Statement of Comprehensive Income as an expense when incurred.

Following initial recognition of development expenditure, the cost model is applied requiring the asset to be carried at cost less any accumulated amortisation and accumulated impairment losses.

All intangible assets were assessed for indications of impairment as at 30 June 2015.

### 1.19 Assets Held for Sale

Assets are classified as held for sale if their carrying amount will be recovered principally through a sale transaction rather than continuing use and a sale is highly probable. They are measured at the lower of their carrying amount and fair value less costs to sell.

Assets classified as held for sale are not depreciated or amortised.



## Note 1: Summary of Significant Accounting Policies *(continued)*

### 1.20 Taxation

The Corporation is exempt from all forms of taxation except Fringe Benefits Tax (FBT) and the Goods and Services Tax (GST).

Revenues, expenses and assets are recognised net of GST except:

- where the amount of GST incurred is not recoverable from the Australian Taxation Office; and
- for receivables and payables.

### Note 2: Events After the Reporting Period

There was no subsequent event that had the potential to significantly affect the on-going structure and financial activities of the Corporation.

### Note 3: Expenses

	2015 \$'000	2014 \$'000
<b>3A – Employee Benefits</b>		
Wages and salaries	9,197	8,350
Superannuation		
Defined contribution plans	964	837
Defined benefits plans	221	134
Leave and other entitlements	(1)	112
Separation and redundancies	360	124
<b>Total employee benefits</b>	<b>10,741</b>	<b>9,557</b>

2015	Cross-commodity \$'000	Coarse grains \$'000	Grain legumes \$'000	Oilseeds \$'000	Wheat \$'000	Total \$'000
<b>3B – Research and Development</b>						
<b>National</b>	<b>136,153</b>	<b>1,121</b>	<b>6,131</b>	<b>875</b>	<b>5,024</b>	<b>149,304</b>
<b>Northern region</b>	<b>9,861</b>	<b>-</b>	<b>300</b>	<b>-</b>	<b>-</b>	<b>10,161</b>
<b>Southern region</b>	<b>18,558</b>	<b>19</b>	<b>-</b>	<b>345</b>	<b>520</b>	<b>19,442</b>
<b>Western region</b>	<b>14,464</b>	<b>-</b>	<b>-</b>	<b>398</b>	<b>338</b>	<b>15,200</b>
<b>TOTAL</b>	<b>179,036</b>	<b>1,140</b>	<b>6,431</b>	<b>1,618</b>	<b>5,882</b>	<b>194,107</b>
2014	155,748	830	5,322	714	2,755	165,369

The aforementioned classification of national and regional payments is usually based on investment recommendations by the three Regional Panels and the National Panel. The project outcomes may, however, have impacts across one or more regions.

	2015 \$'000	2014 \$'000
<b>Research and Development payments in connection with</b>		
Related parties	22,597	27,044
External parties	171,510	138,325
<b>Total Research and Development payments</b>	<b>194,107</b>	<b>165,369</b>



### Note 3: Expenses *(continued)*

	2015 \$'000	2014 \$'000
<b>3C – Suppliers</b>		
<b>Goods and services supplied or rendered</b>		
Staff travel and accommodation	1,339	1,359
Consultants	4	5
Panel expenses	2,297	2,314
Communications	95	75
Corporate governance	579	281
Corporate services	2,435	3,078
Levy collection costs	634	590
Other	763	803
<b>Total goods and services supplied or rendered</b>	<b>8,146</b>	<b>8,505</b>
<b>Goods supplied in connection with</b>		
External parties	45	62
<b>Total goods supplied</b>	<b>45</b>	<b>62</b>
<b>Services rendered in connection with</b>		
Related parties	634	590
External parties	7,467	7,853
<b>Total services rendered</b>	<b>8,101</b>	<b>8,443</b>
<b>Total goods and services supplied or rendered</b>	<b>8,146</b>	<b>8,505</b>
<b>Other supplier expenses</b>		
<b>Operating lease rentals in connection with</b>		
External parties		
Minimum lease payments	1,181	195
Workers compensation expenses	47	36
<b>Total other suppliers</b>	<b>1,228</b>	<b>231</b>
<b>Total suppliers</b>	<b>9,374</b>	<b>8,736</b>
<b>3D – Depreciation and Amortisation</b>		
<b>Depreciation:</b>		
Property, plant and equipment	114	85
Buildings	421	210
<b>Total depreciation</b>	<b>535</b>	<b>295</b>
<b>Amortisation:</b>		
Intangibles:		
Software	198	165
<b>Total amortisation</b>	<b>198</b>	<b>165</b>
<b>Total depreciation and amortisation</b>	<b>733</b>	<b>460</b>
<b>3E – Write-down and Impairment of Assets</b>		
<b>Asset write-downs and impairments from:</b>		
Investments (shares) – revaluation decrement	1,040	293
<b>Total write-down and impairment of assets</b>	<b>1,040</b>	<b>293</b>



## Note 4: Own-source Income

	2015 \$'000	2014 \$'000
<b>OWN-SOURCE REVENUE</b>		
<b>Note 4A – Interest</b>		
Deposits	2,134	2,074
<b>Note 4B – Industry Contributions</b>		
Coarse grains	27,266	25,850
Grain legumes	10,241	8,224
Oilseeds	16,110	21,549
Wheat	63,849	64,627
<b>Total industry contributions</b>	<b>117,466</b>	<b>120,250</b>
<b>Note 4C – Project Refunds</b>		
Cross commodity	3,653	3,042
Coarse grains	(33)	138
Grain legumes	19	2
Oilseeds	2	9
Wheat	34	67
<b>Total project refunds</b>	<b>3,675</b>	<b>3,258</b>
<b>Project Refunds in connection with</b>		
Related parties	605	106
External parties	3,070	3,152
<b>Total project refunds</b>	<b>3,675</b>	<b>3,258</b>
<b>Note 4D – Royalties</b>		
Coarse grains	2,301	2,581
Grain legumes	1,205	608
Oilseeds	268	194
Wheat	1,566	2,781
Other	18	29
<b>Total royalties</b>	<b>5,358</b>	<b>6,193</b>
<b>Royalties in connection with</b>		
Related parties	103	109
External parties	5,255	6,084
<b>Total royalties</b>	<b>5,358</b>	<b>6,193</b>
<b>Note 4E – Grants Income</b>		
Related parties	500	197
External parties	436	1,009
<b>Total grants income</b>	<b>936</b>	<b>1,206</b>



## Note 4: Own-source Income (continued)

	2015	2014
	\$'000	\$'000
<b>Note 4F – Other Revenue</b>		
Levy penalties	124	167
Groundcover advertising income	274	162
Publications revenue	27	15
Other income	83	19
<b>Total other revenue</b>	<b>508</b>	<b>363</b>
<b>GAINS</b>		
<b>Note 4G – Other Gains</b>		
Gain on disposal of investments	54	1,716
Change in fair value through profit and loss	5,019	5,480
<b>Total other gains</b>	<b>5,073</b>	<b>7,196</b>
<b>Note 4H – Revenue from Government</b>		
Department of Agriculture		
PIRD Act 1989 contribution	67,986	68,605

## Note 5: Fair Value Measurements

The following tables provide an analysis of assets and liabilities that are measured at fair value. The different levels of the fair value hierarchy are defined below.

- Level 1: Quoted prices (unadjusted) in active markets for identical assets or liabilities that the Corporation can access at measurement date.
- Level 2: Inputs other than quoted prices included within Level 1 that are observable for the asset or liability, either directly or indirectly.
- Level 3: Unobservable inputs for the asset or liability.



## Note 5: Fair Value Measurements *(continued)*

### Note 5A – Fair Value Measurements, Valuation Techniques and Inputs Used

	Fair value measurements at the end of the reporting period			For Levels 2 and 3 fair value measurements			
	2015 \$'000	2014 \$'000	Category (Level 1, 2 or 3) <sup>3</sup>	Valuation technique(s) <sup>1</sup>	Inputs used	Range (weighted average)	Sensitivity to the fair value measurement to changes in unobservable inputs
<b>Financial assets</b>							
Investments in managed funds	150,891	145,872	Level 1				
<b>Total financial assets</b>	<b>150,891</b>	<b>145,872</b>					
<b>Non-financial assets<sup>2</sup></b>							
Leasehold land	-	690	Level 3	Market Approach	Price per square metre	\$450-\$600 (\$500)	A significant increase (decrease) in the unobservable inputs would result in a significantly higher (lower) fair value measurement
Building on leasehold land	-	3,310	Level 3	Income Approach	Rental price per square metre	\$350-\$370 (\$360)	A significant increase (decrease) in the unobservable inputs would result in a significantly higher (lower) fair value measurement.
					Capitalisation rate	9.5%-10% (9.75%)	A significant increase (decrease) in the unobservable inputs would result in a significantly lower (higher) fair value measurement.
Leasehold improvements	3,390	1,484	Level 3	Depreciated Replacement Cost	Replacement cost new	N/A	A significant increase (decrease) in the unobservable inputs would result in a significantly lower (higher) fair value measurement
					Consumed economic benefit/ Obsolescence of asset	10%	
Other property, plant and equipment	924	212	Level 2	Market Approach	Adjusted market transactions		
<b>Total non-financial assets</b>	<b>4,314</b>	<b>5,696</b>					
<b>Total fair value measurements of assets in the Statement of Financial Position</b>	<b>155,205</b>	<b>151,568</b>					

1 No change in valuation technique occurred during the period.

2 **Fair value measurements – highest and best use differs from current use for non-financial assets (NFAs).**

The Corporation's assets are held for operational purposes and not held for the purposes of deriving a profit. The current use of the assets is considered the highest and best use.

3 **Recurring and non-recurring Level 3 fair value measurements – valuation processes.**

The Corporation procured valuation services from Australian Valuation Solutions (AVS) and relied on valuation models provided by AVS. The Corporation tests the procedures of the valuation model at least once every 12 months. AVS provided written assurance to the Corporation that the model developed is in compliance with AASB 13.



## Note 5: Fair Value Measurements *(continued)*

### Note 5B – Level 1 and Level 2 Transfers for Recurring Fair Value Measurements

There have been no transfers between levels 1 and 2 during the year.

The Corporation's policy for determining when transfers between levels are deemed to have occurred can be found in Note 1.

### Note 5C – Reconciliation for Recurring Level 3 Fair Value Measurements

#### Recurring Level 3 fair value measurements – reconciliation of assets

	Non-financial assets							
	Land		Buildings		Leasehold Improvements		Total	
	2015 \$'000	2014 \$'000	2015 \$'000	2014 \$'000	2015 \$'000	2014 \$'000	2015 \$'000	2014 \$'000
<b>As at 1 July</b>	<b>690</b>	1,000	<b>3,310</b>	4,704	<b>1,484</b>	-	<b>5,484</b>	5,704
Total gains/(losses) in net cost of services <sup>1</sup>	-	-	<b>(88)</b>	(196)	<b>(333)</b>	(14)	<b>(421)</b>	(210)
Total gains/(losses) in other comprehensive income <sup>2</sup>	<b>52</b>	(310)	<b>336</b>	(1,198)	-	-	<b>388</b>	(1,508)
Transfers to held for sale	<b>(742)</b>	-	<b>(3,558)</b>	-	-	-	<b>(4,300)</b>	-
Transfer from work in progress	-	-	-	-	<b>447</b>	-	<b>447</b>	-
Purchases	-	-	-	-	<b>1,792</b>	1,498	<b>1,792</b>	1,498
<b>Total as at 30 June</b>	-	690	-	3,310	<b>3,390</b>	1,484	<b>3,390</b>	5,484

1 These gains/(losses) are presented in the Statement of Comprehensive Income under Depreciation and Amortisation.

2 These gains/(losses) are presented in the Statement of Comprehensive Income under Changes in Asset Revaluation.

## Note 6: Financial Assets

	2015 \$'000	2014 \$'000
<b>6A – Cash and Cash Equivalents</b>		
Interest bearing cheque account	3,337	2,273
Money market call account	70,599	61,699
Business online saver account	8,598	8,409
<b>Total cash and cash equivalents</b>	<b>82,534</b>	72,381
<b>6B – Trade and Other Receivables</b>		
<b>Goods and services receivables in connection with</b>		
Related entities	16,720	217
External parties	1,303	2,534
<b>Total goods and services receivables</b>	<b>18,023</b>	2,751



## Note 6: Financial Assets *(continued)*

	2015 \$'000	2014 \$'000
<b>Other receivables</b>		
GST receivable from the Australian Taxation Office	8,074	6,663
<b>Total other receivables</b>	<b>8,074</b>	<b>6,663</b>
<b>Total trade and other receivables</b>	<b>26,097</b>	<b>9,414</b>
<b>Trade and other receivables aged as follows:</b>		
Not overdue	24,987	7,948
Overdue by:		
0 to 30 days	4	689
31 to 60 days	-	-
61 to 90 days	-	-
more than 90 days	1,106	777
	<b>1,110</b>	<b>1,466</b>
<b>Total trade and other receivables</b>	<b>26,097</b>	<b>9,414</b>

All receivables are expected to be recovered in no more than 12 months.

No indicators of impairment were found for trade and other receivables.

	2015 \$'000	2014 \$'000
<b>6C – Investments Accounted for Using the Equity Method</b>		
Investments in associates:		
Novozymes Biologicals Australia Pty Ltd	-	431
<b>Total investments accounted for using the equity method</b>	<b>-</b>	<b>431</b>

All such investments are expected to be recovered in more than 12 months.

### Details of investments accounted for using the equity method

Name of entity	Principal activity	Reporting date	Ownership	
			2015 %	2014 %
Novozymes Biologicals Australia Pty Ltd <sup>1,2</sup>	Soil inoculant research and development	30 September	-	50.0

1 Incorporated in Australia.

2 This investment was transferred to Held for Sale during the reporting period.



## Note 6: Financial Assets *(continued)*

### Summarised financial information of associates:

	2015	2014
	\$'000	\$'000
<b>Statement of financial position</b>		
Assets	2,821	1,929
Liabilities	(1,902)	(1,067)
Net assets	919	862
<b>Statement of comprehensive income</b>		
Income	1,082	770
Expenses	(852)	(795)
Net (deficit)	230	(25)
<b>Share of associates' net surplus/(deficit)</b>		
Share of net surplus/(deficit) before tax	29	(31)
Income tax expense	-	-
<b>Share of associates' net surplus/(deficit) after tax</b>	<b>29</b>	<b>(31)</b>

Immediately prior to classifying this investment as Held for Sale, the Corporation recognised its share of net surplus for the reporting period.

	2015	2014
	\$'000	\$'000
<b>6D – Investments in Managed Funds</b>		
<b>BT Individually Managed Fund</b>	<b>60,142</b>	<b>57,843</b>
At market value		
<b>UBS Individually Managed Fund</b>	<b>58,010</b>	<b>56,317</b>
At market value		
<b>EQT Individually Managed Fund</b>	<b>32,739</b>	<b>31,712</b>
At market value		
<b>Total investments</b>	<b>150,891</b>	<b>145,872</b>

#### *Individually managed funds*

The funds are available at call. Interest rates will vary to reflect varying market interest rates.

#### *Ministerial approval*

The Corporation has received approval under paragraph 59(1)(b)(iii) of the *Public Governance, Performance and Accountability Act 2013* to hold the investments listed above.



## Note 6: Financial Assets *(continued)*

	2015 \$'000	2014 \$'000
<b>6E – Investments – Other</b>		
<b>Shares in unlisted companies</b>		
Australian Grain Technologies Pty Ltd	11,386	11,386
Provision for diminution in share value	(7,171)	(7,171)
	4,215	4,215
Australian Centre for Plant Functional Genomics Pty Ltd	21	21
Provision for diminution in share value	(21)	(8)
	-	13
Arista Cereal Technologies Pty Ltd	4,400	4,000
Provision for diminution in share value	(2,939)	(2,582)
	1,461	1,418
InterGrain Pty Ltd	7,200	7,200
Provision for diminution in share value	(6,061)	(5,392)
	1,139	1,808
Canola Breeders Western Australia Pty Ltd	-	3,227
Provision for diminution in share value	-	(3,227)
	-	-
<b>Gross Investments – Other</b>	<b>23,007</b>	<b>25,834</b>
<b>Total provision for diminution in share value</b>	<b>(16,192)</b>	<b>(18,380)</b>
<b>Net investments - Other</b>	<b>6,815</b>	<b>7,454</b>

The shares held are ordinary shares.

All such investments are expected to be recovered in more than 12 months.



## Note 7: Non-Financial Assets

	2015	2014
	\$'000	\$'000
<b>7A – Land and Buildings</b>		
<b>Leasehold land</b>		
Fair value	-	690
<b>Total land</b>	-	690
<b>Buildings on leasehold land</b>		
Fair value	-	3,310
Accumulated depreciation	-	-
<b>Total buildings on leasehold land</b>	-	3,310
<b>Leasehold improvements</b>		
Fair value	3,723	1,484
Work in progress	-	447
Accumulated depreciation	(333)	-
<b>Total leasehold improvements</b>	3,390	1,931
<b>Total land and buildings</b>	3,390	5,931
No indicators of impairment were found for land and buildings.		
Land and buildings are expected to be sold within the next 12 months and have been transferred to Held for Sale during the reporting period.		
<b>7B – Property, Plant and Equipment</b>		
Fair value	1,038	212
Accumulated depreciation	(114)	-
<b>Total property, plant and equipment</b>	924	212
Movement in asset revaluation reserve		
Increment for land	52	(310)
Increment for buildings	336	(1,198)
Decrement for property, plant and equipment	-	(29)
<b>Total movement in asset revaluation reserve</b>	388	(1,537)

No indicators of impairment were found for property, plant and equipment.

No property, plant or equipment is expected to be sold or disposed of within the next 12 months.



## Note 7: Non-Financial Assets *(continued)*

### Revaluation of non-financial assets

All revaluations were conducted in accordance with the revaluation policy stated at Note 5. A revaluation of land and building immediately prior to the classification as Held for Sale was conducted during the reporting period by an independent valuer, Australian Valuation Solutions Pty Ltd, and a formal revaluation of property, plant and equipment was also conducted by Australian Valuation Solutions Pty Ltd as at 30 June 2014.

No revaluation decrements were expensed during the year (2014: \$NIL).

### 7C – Reconciliation of the Opening and Closing Balances of Property, Plant and Equipment 2015

	Leasehold Land \$'000	Buildings on Leasehold Land \$'000	Other Property, Plant & Equipment \$'000	Total \$'000
<b>As at 1 July 2014</b>				
Gross book value	690	5,241	212	6,143
Accumulated depreciation and impairment	-	-	-	-
<b>Net book value 1 July 2014</b>	<b>690</b>	<b>5,241</b>	<b>212</b>	<b>6,143</b>
Additions:				
By purchase	-	1,792	826	2,618
Revaluations and impairment recognised in other comprehensive income	52	336	-	388
Transfer to assets held for sale	(742)	(3,558)	-	(4,300)
Depreciation expense	-	(421)	(114)	(535)
<b>Net book value 30 June 2015</b>	<b>-</b>	<b>3,390</b>	<b>924</b>	<b>4,314</b>
<b>Net book value as at 30 June 2015 represented by:</b>				
Gross book value	-	3,723	1,038	4,761
Accumulated depreciation and impairment losses	-	(333)	(114)	(447)
<b>Net book value 30 June 2015</b>	<b>-</b>	<b>3,390</b>	<b>924</b>	<b>4,314</b>



## Note 7: Non-Financial Assets *(continued)*

### 7C – Reconciliation of the Opening and Closing Balances of Property, Plant and Equipment 2014 *(continued)*

	Leasehold Land \$'000	Buildings on Leasehold Land \$'000	Other Property, Plant & Equipment \$'000	Total \$'000
<b>As at 1 July 2013</b>				
Gross book value	1,000	4,900	372	6,272
Accumulated depreciation and impairment	-	(196)	(163)	(359)
<b>Net book value 1 July 2013</b>	<b>1,000</b>	<b>4,704</b>	<b>209</b>	<b>5,913</b>
Additions:				
By purchase	-	1,403	117	1,520
Make good	-	542	-	542
Revaluations and impairment recognised in other comprehensive income	(310)	(1,198)	(29)	(1,537)
Depreciation expense	-	(210)	(85)	(295)
<b>Net book value 30 June 2014</b>	<b>690</b>	<b>5,241</b>	<b>212</b>	<b>6,143</b>
<b>Net book value as at 30 June 2014 represented by:</b>				
Gross book value	690	5,241	212	6,143
Accumulated depreciation and impairment losses	-	-	-	-
<b>Net book value 30 June 2014</b>	<b>690</b>	<b>5,241</b>	<b>212</b>	<b>6,143</b>

	2015 \$'000	2014 \$'000
<b>7D – Intangibles</b>		
Information management system – at cost	727	727
Accumulated amortisation	(727)	(727)
<b>Total information management system</b>	<b>-</b>	<b>-</b>
Software – at cost	1,306	1,188
Accumulated amortisation	(831)	(633)
<b>Total software</b>	<b>475</b>	<b>555</b>
Intellectual property – at cost	140	127
<b>Total intangibles</b>	<b>615</b>	<b>682</b>

No indicators of impairment were found for intangible assets.

No intangibles are expected to be sold or disposed of within the next 12 months.



## Note 7: Non-Financial Assets *(continued)*

### 7E – Reconciliation of the Opening and Closing Balances of Intangibles 2015

	Information Management System	Software	Intellectual Property	Total
	\$'000	\$'000	\$'000	\$'000
<b>As at 1 July 2014</b>				
Gross book value	727	1,188	127	2,042
Accumulated amortisation and impairment	(727)	(633)	-	(1,360)
<b>Net book value 1 July 2014</b>	<b>-</b>	<b>555</b>	<b>127</b>	<b>682</b>
Additions				
By purchase	-	118	13	131
Amortisation expense	-	(198)	-	(198)
<b>Net book value 30 June 2015</b>	<b>-</b>	<b>475</b>	<b>140</b>	<b>615</b>
<b>Net book value as at 30 June 2015 represented by:</b>				
Gross book value	727	1,306	140	2,173
Accumulated amortisation and impairment	(727)	(831)	-	(1,558)
<b>Net book value 30 June 2015</b>	<b>-</b>	<b>475</b>	<b>140</b>	<b>615</b>

### 7E – Reconciliation of the Opening and Closing Balances of Intangibles 2014

	Information Management System	Software	Intellectual Property	Total
	\$'000	\$'000	\$'000	\$'000
<b>As at 1 July 2013</b>				
Gross book value	727	988	115	1,830
Accumulated amortisation and impairment	(727)	(468)	-	(1,195)
<b>Net book value 1 July 2013</b>	<b>-</b>	<b>520</b>	<b>115</b>	<b>635</b>
Additions				
By purchase	-	200	12	212
Amortisation expense	-	(165)	-	(165)
<b>Net book value 30 June 2014</b>	<b>-</b>	<b>555</b>	<b>127</b>	<b>682</b>
<b>Net book value as at 30 June 2014 represented by:</b>				
Gross book value	727	1,188	127	2,042
Accumulated amortisation and impairment	(727)	(633)	-	(1,360)
<b>Net book value 30 June 2014</b>	<b>-</b>	<b>555</b>	<b>127</b>	<b>682</b>



## Note 7: Non-Financial Assets *(continued)*

	2015	2014
	\$'000	\$'000
<b>7F – Other Non-Financial Assets</b>		
Accrued interest	151	168
Accrued income	1,472	23,502
Prepayments	123	50
Lease incentive	589	1,615
<b>Total other non-financial assets</b>	<b>2,335</b>	<b>25,335</b>

All non-financial assets are expected to be recovered in no more than 12 months.

No indicators of impairment were found for other non-financial assets.

### ***Accrued interest***

The interest rates range from 1.15% to 2.50% (2014: 1.75% to 2.75%) and the frequency of payments is monthly.

## Note 8: Assets Held for Sale

The following assets have been classified as held for sale:

	2015	2014
	\$'000	\$'000
Investments – shares in unlisted companies	460	-
Land and buildings on leasehold land	4,300	-
<b>Total assets held for sale</b>	<b>4,760</b>	<b>-</b>



## Note 9: Payables

	2015 \$'000	2014 \$'000
<b>9A – Suppliers</b>		
Trade creditors – external parties	1,444	1,315
Accrued expenses – external parties	605	936
<b>Total supplier payables</b>	<b>2,049</b>	<b>2,251</b>
Supplier payables are expected to be settled in:		
No more than 12 months	1,849	2,222
More than 12 months	200	29
<b>Total supplier payables</b>	<b>2,049</b>	<b>2,251</b>
<b>9B – Research and Development</b>		
Research and development – related parties	7,255	12,050
Research and development – external parties	69,977	45,252
<b>Total research and development payables</b>	<b>77,232</b>	<b>57,302</b>
Research and development payables are expected to be settled in:		
No more than 12 months	77,082	56,369
More than 12 months	150	933
<b>Total research and development payables</b>	<b>77,232</b>	<b>57,302</b>
<b>9C – Other Payables</b>		
Unearned grant income – related parties	3,464	-
<b>Total other payables</b>	<b>3,464</b>	<b>-</b>
Other payables are expected to be settled in:		
No more than 12 months	1,155	-
More than 12 months	2,309	-
<b>Total other payables</b>	<b>3,464</b>	<b>-</b>



## Note 10: Provisions

	2015 \$'000	2014 \$'000
<b>10A – Employee Provisions</b>		
Leave	2,162	2,084
<b>Total employee provisions</b>	<b>2,162</b>	<b>2,084</b>
Employee provisions are expected to be settled in:		
No more than 12 months	1,724	1,541
More than 12 months	438	543
<b>Total employee provisions</b>	<b>2,162</b>	<b>2,084</b>
<b>10B – Other Provisions</b>		
Lease incentive	1,577	1,756
Provision for make good	542	542
<b>Total other provisions</b>	<b>2,119</b>	<b>2,298</b>
Other provisions are expected to be settled in:		
No more than 12 months	179	179
More than 12 months	1,940	2,119
<b>Total other provisions</b>	<b>2,119</b>	<b>2,298</b>

The Corporation currently has an agreement for the leasing of premises which have provisions requiring the Corporation to restore the premises to their original condition at the conclusion of the lease. The Corporation has made a provision to reflect the present value of this obligation.

## Note 11: Cash Flow Reconciliation

Reconciliation of cash and cash equivalents as per Statement of Financial Position to Cash Flow Statement

	Notes	2015 \$'000	2014 \$'000
<b>Cash and cash equivalents as per:</b>			
Cash Flow Statement		82,534	72,381
Statement of Financial Position	6A	82,534	72,381
<b>Difference</b>		<b>-</b>	<b>-</b>



## Note 11: Cash Flow Reconciliation *(continued)*

Reconciliation of net cost of services to net cash from/(used by) operating activities:

	2015	2014
	\$'000	\$'000
Net cost of services	(80,845)	(43,875)
Revenue from Government	67,986	68,605
Share of surplus/(deficit) of associates	29	(31)
<b>Adjustments for non-cash items</b>		
Depreciation/amortisation	733	460
Net write down of financial assets	1,040	293
Share of net (surplus)/loss of associates	(29)	31
Revaluation of investments	808	139
Gain on disposal of investments	-	(1,716)
<b>Movements in assets and liabilities</b>		
<b>Assets</b>		
(Increase)/decrease in trade and other receivables	(16,683)	(2,579)
(Increase)/decrease in lease incentive asset	1,026	(1,616)
(Increase)/decrease in other non-financial assets	21,974	(17)
<b>Liabilities</b>		
Increase/(decrease) in employee provisions	78	111
Increase/(decrease) in lease incentive provision	(179)	1,756
Increase/(decrease) in trade and other payables	23,192	(22,661)
<b>Net cash from operating activities</b>	<b>19,130</b>	<b>(1,100)</b>

## Note 12: Related Party Disclosures

The following persons were Directors of the Grains Research and Development Corporation during the year:

Mr Richard Clark (Chair)  
 Ms Jennifer Goddard (term finished 3 November 2014)  
 Mr Richard Brimblecombe (term finished 3 November 2014)  
 Dr Jeremy Burdon (re-appointed 4 November 2014)  
 Mr Kim Halbert (Deputy Chair, re-appointed 4 November 2014)  
 Professor Robert Lewis (term finished 3 November 2014)  
 Ms Sharon Starick (term finished 3 November 2014)  
 Mr John Woods (re-appointed 4 November 2014)  
 Dr Andrew Barr (appointed 4 November 2014)  
 Dr Helen Garnett (appointed 4 November 2014)  
 Mr David Shannon (appointed 4 November 2014)  
 Ms Roseanne Healy (appointed 4 November 2014)  
 Mr John Harvey (Executive Director)

Several directors of the Corporation hold directorships with other companies. Any transactions between the Corporation and companies with a Director common to the Corporation are conducted using commercial and arms-length principles.



## Note 13: Senior Management Personnel Remuneration

	2015 \$	2014 \$
<b>Short-term employee benefits:</b>		
Salary	1,500,976	1,775,511
Performance bonuses	150,205	110,657
<b>Total short-term employee benefits</b>	<b>1,651,181</b>	1,886,168
<b>Post-employment benefits:</b>		
Superannuation	166,649	155,273
<b>Total post-employment benefits</b>	<b>166,649</b>	155,273
<b>Other long-term benefits:</b>		
Annual leave	102,511	93,584
Long service leave	31,089	27,551
<b>Total other long-term benefits</b>	<b>133,600</b>	121,135
<b>Termination benefits</b>	<b>107,682</b>	74,984
<b>Total senior executive remuneration expenses</b>	<b>2,059,112</b>	2,237,560

The total number of senior management personnel that are included in the above table are 19 individuals (2014: 15 individuals).

## Note 14: Remuneration of Auditors

The cost of financial statement audit services provided to the Corporation was:

	2015 \$	2014 \$
Australian National Audit Office	31,000	29,000

No other services were provided by the auditors of the financial statements.



## Note 15: Financial Instruments

### 15A – Categories of Financial Instruments

	2015 \$'000	2014 \$'000
<b>Financial Assets</b>		
<b>Loans and receivables</b>		
Cash and cash equivalents	82,534	72,381
Trade and other receivables	18,023	2,751
<b>Total loans and receivables</b>	<b>100,557</b>	<b>75,132</b>
<b>Available-for-sale financial assets</b>		
Shares in unlisted companies	6,815	7,454
<b>Total available-for-sale financial assets</b>	<b>6,815</b>	<b>7,454</b>
<b>Financial assets at fair value through profit or loss (designated)</b>		
Managed funds	150,891	145,872
<b>Total financial assets at fair value through profit or loss (designated)</b>	<b>150,891</b>	<b>145,872</b>
<b>Total financial assets</b>	<b>258,263</b>	<b>228,458</b>
<b>Financial Liabilities</b>		
<b>Financial liabilities measured at amortised cost</b>		
Payables	78,676	58,617
<b>Total financial liabilities measured at amortised cost</b>	<b>78,676</b>	<b>58,617</b>
<b>Total financial liabilities</b>	<b>78,676</b>	<b>58,617</b>

### Note 15B – Net Gains or Losses on Financial Assets

	2015 \$'000	2014 \$'000
<b>Loans and receivables</b>		
Interest revenue (note 4A)	2,134	2,074
<b>Net gain on loans and receivables</b>	<b>2,134</b>	<b>2,074</b>
<b>Available-for-sale financial assets</b>		
Impairment (note 3E)	(1,040)	(293)
<b>Net (loss) on available-for-sale financial assets</b>	<b>(1,040)</b>	<b>(293)</b>
<b>Financial assets at fair value through profit or loss (designated)</b>		
Change in fair value (note 4G)	5,073	7,196
<b>Net gain on financial assets at fair value through profit and loss (designated)</b>	<b>5,073</b>	<b>7,196</b>
<b>Net gain on financial assets</b>	<b>6,167</b>	<b>8,977</b>

There was no net gain or loss on financial liabilities.



## Note 15: Financial Instruments *(continued)*

### Note 15C – Fair Value of Financial Instruments

The carrying amount of all financial assets and financial liabilities approximate their fair value.

### Note 15D – Credit Risk

The Corporation's maximum exposure to credit risk at reporting date in relation to each class of recognised financial assets is the carrying amount of those assets as indicated in the Statement of Financial Position.

Fair values through profit or loss investments are restricted to securities that are in accordance with 59(b) of the PGPA Act, including, as a minimum, a Standard and Poor's long-term rating of A-. Further restrictions are imposed under the policies and procedures of the Corporation. The majority of loans and receivables are cash and levies from industry.

The Corporation manages its credit risk through:

- a. A monthly review by management of the Corporation's investments:
  - » to ensure that they are in accordance with section 59 of the PGPA Act and the Corporation's policies and procedures; and
  - » to assess how the individually managed fund investments are performing against the set benchmark (the Bloomberg AusBond Government Index 0-5 years);
- b. A biannual review by the Finance, Risk and Audit Committee of the performance of the Corporation's individually managed funds in comparison with other fund managers with a similar investment profile; and
- c. Policies and procedures that guide employees in managing debtors.

The Corporation holds no collateral to mitigate against credit risk.

### Credit quality of financial assets not past due or individually determined as impaired

	Not past due nor impaired 2015 \$'000	Not past due nor impaired 2014 \$'000	Past due or impaired 2015 \$'000	Past due or impaired 2014 \$'000
Cash and cash equivalents	82,534	72,381	-	-
Trade and other receivables	16,913	1,285	1,110	1,466
Managed funds	150,891	145,872	-	-
Shares in unlisted companies	6,815	7,454	19,419	19,879
<b>Total</b>	<b>257,153</b>	<b>226,992</b>	<b>20,529</b>	<b>21,345</b>

### Ageing of financial assets that are past due but not impaired for 2015

	0 to 30 days \$'000	31 to 60 days \$'000	61 to 90 days \$'000	90+ days \$'000	Total \$'000
Receivables	4	-	-	1,106	1,110
<b>Total</b>	<b>4</b>	<b>-</b>	<b>-</b>	<b>1,106</b>	<b>1,110</b>

### Ageing of financial assets that are past due but not impaired for 2014

	0 to 30 days \$'000	31 to 60 days \$'000	61 to 90 days \$'000	90+ days \$'000	Total \$'000
Receivables	689	-	-	777	1,466
<b>Total</b>	<b>689</b>	<b>-</b>	<b>-</b>	<b>777</b>	<b>1,466</b>



## Note 15: Financial Instruments (continued)

### Note 15D – Credit Risk (continued)

The following assets have been individually assessed as impaired:

	2015 \$'000	2014 \$'000
Shares in unlisted companies	19,419	19,879

Factors that have been considered in assessing the shares as impaired include:

- the continued uncertainty in the success and ability of the companies to generate future economic benefits; and
- the decrease in the net assets of the companies.

### Note 15E – Liquidity Risk

The exposure to liquidity risk is based on the notion that the Corporation will encounter difficulty in meeting its obligations associated with financial liabilities.

The Corporation has minimal exposure to liquidity risk. The Corporation receives funding from industry through levies and contributions from the Australian Government. In addition, the Corporation has controls in place to ensure that it has adequate resources to meet its financial obligations and has no past experience of default.

#### Maturities for non-derivative financial liabilities 2015

	On demand \$'000	Within 1 year \$'000	1 to 2 years \$'000	2 to 5 years \$'000	> 5 years \$'000	Total \$'000
Payables	-	78,526	150	-	-	78,676
<b>Total</b>	-	<b>78,526</b>	<b>150</b>	-	-	<b>78,676</b>

#### Maturities for non-derivative financial liabilities 2014

	On demand \$'000	Within 1 year \$'000	1 to 2 years \$'000	2 to 5 years \$'000	> 5 years \$'000	Total \$'000
Payables	-	57,684	472	461	-	58,617
<b>Total</b>	-	<b>57,684</b>	<b>472</b>	<b>461</b>	-	<b>58,617</b>

The Corporation had no derivative financial liabilities in both the current and prior year.

### Note 15F – Market risk

Sensitivity analysis of the risk that the Corporation is exposed to for 2015

	Risk variable	Change in risk variable	Effect on	
			Net cost of services 2015 \$'000	Equity 2015 \$'000
Interest rate risk	Interest	+0.40%	(1,458)	(1,458)
		-0.40%	1,458	1,458
Currency Risk	USD	+10.9%	2	2
		-10.9%	(5)	(5)
Currency Risk	GBP	+10.9%	1	1
		-10.9%	(3)	(3)



## Note 15: Financial Instruments *(continued)*

### Note 15F – Market risk *(continued)*

Sensitivity analysis of the risk that the Corporation is exposed to for 2014

	Risk variable	Change in risk variable	Effect on	
			Net cost of services 2014 \$'000	Equity 2014 \$'000
Interest rate risk	Interest	+ 0.60%	(1,732)	(1,732)
		- 0.60%	1,732	1,732
Currency Risk	USD	+ 11.5%	2	2
		- 11.5%	(3)	(3)

#### **Interest rate risk**

Interest rate risk refers to the risk that the fair value or future cash flows of a financial instrument will fluctuate because of changes in market interest rates. The Corporation is exposed to interest rate risk primarily from managed funds.

A 40 basis point (2014: 60 basis points) change is deemed to be reasonably possible and is used when reporting interest rate risk.

The method used to arrive at the possible risk of 40 basis points was based on both statistical and non-statistical analysis. The statistical analysis has been based on the cash rate for the past five years issued by the Reserve Bank of Australia (RBA) as the underlying dataset. This information is then revised and adjusted for reasonableness under the current economic circumstances.

#### **Currency risk**

Foreign currency risk refers to the risk that the fair value or future cash flows of a financial instrument will fluctuate due to changes in foreign exchange rates. The Corporation is exposed to foreign exchange currency risk primarily through undertaking certain transactions denominated in foreign currency.

The Corporation is exposed to foreign currency denominated in US dollars and GB pounds.

The method used to arrive at the possible risk of 10.9 percent was based on both statistical and non-statistical analyses. The statistical analysis has been based on main currency's movement for the last five years. The five main currencies that the Commonwealth is exposed to are USD, EUR, GBP, JPY and NZD. This information is then revised and adjusted for reasonableness under the current economic circumstances.

#### **Other price risk**

The Corporation is not exposed to other price risk.

## Note 16: Financial Assets Reconciliation

		2015 \$'000	2014 \$'000
<b>Financial assets</b>	<b>Notes</b>		
<b>Total financial assets as per statement of financial position</b>		<b>266,337</b>	235,552
Less: non-financial instrument components:			
Other receivables	6B	8,074	6,663
Investments accounted for using the equity method	6C	-	431
Total non-financial instrument components		8,074	7,094
<b>Total financial assets per financial instruments note</b>		<b>258,263</b>	228,458



## Note 17: Compensation and Debt Relief

No compensation or debt relief payments were made during the reporting period (2014: \$NIL).

## Note 18: Reporting of Outcomes

The Corporation's outputs contribute to a single Outcome (note 1.1).

### Note 18A – Net Cost of Outcome Delivery

	Outcome 1		Total	
	2015 \$'000	2014 \$'000	2015 \$'000	2014 \$'000
<b>Expenses</b>				
Departmental	215,995	184,415	215,995	184,415
<b>Total</b>	<b>215,995</b>	<b>184,415</b>	<b>215,995</b>	<b>184,415</b>
<b>Other own-sourced income</b>				
Departmental				
Interest	2,134	2,074	2,134	2,074
Industry contributions	117,466	120,250	117,466	120,250
Project refunds	3,675	3,258	3,675	3,258
Royalties	5,358	6,193	5,358	6,193
Grants income	936	1,206	936	1,206
Other revenue	508	363	508	363
Gain on disposal of investments	54	1,716	54	1,716
Change in fair value through profit and loss	5,019	5,480	5,019	5,480
<b>Total other own-sourced income</b>	<b>135,150</b>	<b>140,540</b>	<b>135,150</b>	<b>140,540</b>
<b>Net cost of outcome delivery</b>	<b>80,845</b>	<b>43,875</b>	<b>80,845</b>	<b>43,875</b>

## Note 19: Budgetary Reports and Explanations of Major Variances

The following tables provide a comparison of the original budget as presented in the 2014-15 Portfolio Budget Statements (PBS) to the 2014-15 final outcome as presented in accordance with the Australian Accounting Standards for the Corporation. The Budget is not audited.

A 'major variance' has been defined by the Corporation as a variance that is:

- more than +/- \$1 million; and/or
- more than +/- 10% of the line item, excluding variances that are less than \$100,000.



## Note 19: Budgetary Reports and Explanations of Major Variances *(continued)*

### Note 19A – Departmental Budgetary Reports

#### Statement of Comprehensive Income for not-for-profit Reporting Entities for the period ended 30 June 2015

	Actual	Budget estimate	
	2015	Original <sup>1</sup>	Variance <sup>2</sup>
	\$'000	2015 \$'000	2015 \$'000
<b>NET COST OF SERVICES</b>			
<b>Expenses</b>			
Employee benefits	10,741	11,100	359
Supplier expenses	203,481	199,062	(4,419)
Depreciation and amortisation	733	938	205
Write-down and impairment of assets	1,040	2,000	960
<b>Total expenses</b>	<b>215,995</b>	<b>213,100</b>	<b>(2,895)</b>
<b>Own-source Income</b>			
<b>Own-source revenue</b>			
Interest <sup>3</sup>	7,153	5,144	2,009
Grant income	936	732	204
Royalties	5,358	5,065	293
Other	4,183	2,769	1,414
<b>Total own-source revenue</b>	<b>17,630</b>	<b>13,710</b>	<b>3,920</b>
<b>Gains</b>			
Gain on disposal of investments	54	-	54
<b>Total gains</b>	<b>54</b>	<b>-</b>	<b>54</b>
<b>Total own-source income</b>	<b>17,684</b>	<b>13,710</b>	<b>3,974</b>
<b>Net (cost of)/contribution by services</b>	<b>198,311</b>	<b>199,390</b>	<b>1,079</b>
Revenue from Government			
Commonwealth contributions	67,986	68,917	(931)
Industry contributions	117,466	104,733	12,733
Share of surplus/deficit of associates and joint ventures accounted for using the equity method	29	-	29
	<b>185,481</b>	<b>173,650</b>	<b>11,831</b>
<b>Surplus/(Deficit) attributable to the Australian Government</b>	<b>(12,830)</b>	<b>(25,740)</b>	<b>12,910</b>
<b>Total Comprehensive income/(loss)</b>	<b>(12,830)</b>	<b>(25,740)</b>	<b>12,910</b>
<b>Total Comprehensive income/(loss) attributable to the Australian Government</b>	<b>(12,830)</b>	<b>(25,740)</b>	<b>12,910</b>

1 The Corporation's original budgeted financial statement that was first presented to parliament in respect of the reporting period was the Corporation's 2014-15 Portfolio Budget Statements (PBS).

2 Between the actual and original budgeted amounts for 2015. Explanations of major variances are provided further below.

3 The difference between 'Interest' in the Statement of Comprehensive Income and the amount shown at Note 19A relates to the disclosure of the interest earned on the investments in managed funds, which is shown in the Statement of Comprehensive Income as 'Gain – Change in Fair Value through Profit and Loss'.



## Note 19: Budgetary Reports and Explanations of Major Variances *(continued)*

### Note 19A – Departmental Budgetary Reports *(continued)*

#### Statement of Financial Position for not-for-profit Reporting Entities as at 30 June 2015

	Actual	Budget estimate	
		Original <sup>1</sup>	Variance <sup>2</sup>
	2015 \$'000	2015 \$'000	2015 \$'000
<b>ASSETS</b>			
<b>Financial assets</b>			
Cash and cash equivalents	82,534	34,337	48,197
Trade and other receivables	26,097	28,721	(2,624)
Investments	150,891	147,391	3,500
Investments accounted for under the equity method	-	4,699	(4,699)
Other investments	6,815	11,217	(4,402)
<b>Total financial assets</b>	<b>266,337</b>	<b>226,365</b>	<b>39,972</b>
<b>Non-financial assets</b>			
Land and buildings	3,390	5,312	(1,922)
Property, plant and equipment	924	5,060	(4,136)
Intangibles	615	541	74
Other non-financial assets	2,335	367	1,968
<b>Total non-financial assets</b>	<b>7,264</b>	<b>11,280</b>	<b>(4,016)</b>
<b>Assets held for sale</b>	<b>4,760</b>	<b>-</b>	<b>4,760</b>
<b>Total assets</b>	<b>278,361</b>	<b>237,645</b>	<b>40,716</b>
<b>LIABILITIES</b>			
<b>Payables</b>			
Suppliers	79,281	65,449	(13,832)
Other payables	3,464	-	(3,464)
<b>Total payables</b>	<b>82,745</b>	<b>65,449</b>	<b>(17,296)</b>
<b>Provisions</b>			
Employee provisions	2,162	2,173	11
Other provisions	2,119	350	(1,769)
<b>Total provisions</b>	<b>4,281</b>	<b>2,523</b>	<b>(1,758)</b>
<b>Total liabilities</b>	<b>87,026</b>	<b>67,972</b>	<b>(19,054)</b>
<b>Net assets</b>	<b>191,335</b>	<b>169,673</b>	<b>21,662</b>
<b>EQUITY</b>			
Reserves	111,114	108,113	3,001
Retained earnings	80,221	61,560	18,661
<b>Total equity</b>	<b>191,335</b>	<b>169,673</b>	<b>21,662</b>

1 The Corporation's original budgeted financial statement that was first presented to parliament in respect of the reporting period was the Corporation's 2014-15 Portfolio Budget Statements (PBS).

2 Between the actual and original budgeted amounts for 2015. Explanations of major variances are provided further below.





## Note 19: Budgetary Reports and Explanations of Major Variances *(continued)*

### Note 19A – Departmental Budgetary Reports *(continued)*

#### Statement of Changes in Equity for not-for-profit Reporting Entities as at 30 June 2015

	Retained earnings			Asset revaluation reserve			Other reserves			Total equity		
	Actual	Budget Estimate		Actual	Budget Estimate		Actual	Budget Estimate		Actual	Budget Estimate	
		Original <sup>1</sup>	Variance <sup>2</sup>		Original <sup>1</sup>	Variance <sup>2</sup>		Original <sup>1</sup>	Variance <sup>2</sup>		Original <sup>1</sup>	Variance <sup>2</sup>
	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000	2015 \$'000
<b>Opening balance</b>	<b>96,901</b>	80,900	16,001	<b>2,376</b>	3,913	(1,537)	<b>104,500</b>	110,600	(6,100)	<b>203,777</b>	195,413	8,364
<b>Comprehensive income</b>												
Other comprehensive income	-	-	-	<b>388</b>	-	388	-	-	-	<b>388</b>	-	388
Surplus/(deficit) for the period	<b>(12,830)</b>	(25,740)	12,910	-	-	-	-	-	-	<b>(12,830)</b>	(25,740)	12,910
<b>Total comprehensive income</b>	<b>(12,830)</b>	(25,740)	12,910	<b>388</b>	-	388	-	-	-	<b>(12,442)</b>	(25,740)	13,298
of which: attributed to Australian Government	<b>(12,830)</b>	(25,740)	12,910	<b>388</b>	-	388	-	-	-	<b>(12,442)</b>	(25,740)	13,298
Transfers between equity components	<b>(3,850)</b>	6,400	(10,250)	-	-	-	<b>3,850</b>	(6,400)	10,250	-	-	-
<b>Closing balance as at 30 June 2015</b>	<b>80,221</b>	61,560	18,661	<b>2,764</b>	3,913	(1,149)	<b>108,350</b>	104,200	4,150	<b>191,335</b>	169,673	21,662
<b>Closing balance attributable to Australian Government</b>	<b>80,221</b>	61,560	18,661	<b>2,764</b>	3,913	(1,149)	<b>108,350</b>	104,200	4,150	<b>191,335</b>	169,673	21,662

1 The Corporation's original budgeted financial statement that was first presented to parliament in respect of the reporting period was the Corporation's 2014-15 Portfolio Budget Statements (PBS).

2 Between the actual and original budgeted amounts for 2015. Explanations of major variances are provided further below.

## Note 19: Budgetary Reports and Explanations of Major Variances *(continued)*

### Note 19A – Departmental Budgetary Reports *(continued)*

#### Cash Flow Statement for not-for-profit Reporting Entities for the period ended 30 June 2015

	Actual	Budget estimate	
		Original <sup>1</sup>	Variance <sup>2</sup>
	2015 \$'000	2015 \$'000	2015 \$'000
<b>OPERATING ACTIVITIES</b>			
<b>Cash received</b>			
Industry contributions	117,530	104,733	12,797
Revenue from Government	72,889	70,172	2,717
Interest	7,979	5,144	2,835
Grant income	5,200	732	4,468
Net GST received	15,330	19,906	(4,576)
Other	13,289	7,834	5,455
<b>Total cash received</b>	<b>232,217</b>	<b>208,521</b>	<b>23,696</b>
<b>Cash used</b>			
Employees	10,664	11,050	386
Suppliers	202,423	215,824	13,401
<b>Total cash used</b>	<b>213,087</b>	<b>226,874</b>	<b>13,787</b>
<b>Net cash from/(used by) operating activities</b>	<b>19,130</b>	<b>(18,353)</b>	<b>37,483</b>
<b>INVESTING ACTIVITIES</b>			
<b>Cash received</b>			
Investments	-	10,000	(10,000)
<b>Total cash received</b>	<b>-</b>	<b>10,000</b>	<b>(10,000)</b>
<b>Cash used</b>			
Purchase of property, plant and equipment	2,749	400	(2,349)
Investments	6,228	6,100	(128)
<b>Total cash used</b>	<b>8,977</b>	<b>6,500</b>	<b>(2,477)</b>
<b>Net cash from/(used by) investing activities</b>	<b>(8,977)</b>	<b>3,500</b>	<b>(12,477)</b>
<b>Net increase/(decrease) in cash held</b>	<b>10,153</b>	<b>(14,853)</b>	<b>25,006</b>
Cash and cash equivalents at the beginning of the reporting period	72,381	49,190	23,191
<b>Cash and cash equivalents at the end of the reporting period</b>	<b>82,534</b>	<b>34,337</b>	<b>48,197</b>

1 The Corporation's original budgeted financial statement that was first presented to parliament in respect of the reporting period was the Corporation's 2014-15 Portfolio Budget Statements (PBS).

2 Between the actual and original budgeted amounts for 2015. Explanations of major variances are provided further below.



## Note 19: Budgetary Reports and Explanations of Major Variances *(continued)*

### Note 19B – Departmental Major Budget Variances for 2015

Explanation of major variances	Affected line items (and statement)
Supplier expenses were more than budget due to the decision by senior management to invest in additional R&D above the budgeted amount during the reporting period.	Supplier expenses – Statement of Comprehensive Income
There were two contributors to the underspend in depreciation and amortisation: (1) a delay in the planned purchase of new information systems and (2) the reclassification of buildings as held for sale during the reporting period.	Depreciation and amortisation - Statement of Comprehensive Income
Write-down and impairment of assets was less than budget due to a stronger-than anticipated performance by the share companies during the reporting period.	Write-down and impairment of assets - Statement of Comprehensive Income
Interest income was more than budget due to both higher returns and larger cash and investment balances than expected.	Interest – Statement of Comprehensive Income Interest – Cash Flow Statement
Grant income was more than budget due to additional grant agreements being entered into after the budget statement was prepared.	Grant income – Statement of Comprehensive Income
Other income was higher than budget mainly due to the write-off of a number of aged project accruals during the reporting period.	Other income – Statement of Comprehensive Income
Industry contributions were more than budget due to both higher grain prices than expected and an increase in the amount of grain sold for cash (rather than pooled) this reporting period.	Industry contributions – Statement of Comprehensive Income Industry contributions – Cash Flow Statement
Please refer to the various Cash Flow Statement variance explanations for the variance to budget for Cash.	Cash and cash equivalents – Statement of Financial Position
Trade and other receivables were less than budget principally due to the Commonwealth Contribution receivable at 30 June 2015 being lower than anticipated. This was due to the interim payment received from the Department of Agriculture being higher than budgeted, and was then compounded by a lower than budgeted Commonwealth Contribution for the reporting period (due to lower than expected production levels).	Trade and other receivables – Statement of Financial Position
Investments were greater than budget because the cash outflow from operating activities was significantly less than expected, therefore the anticipated sale of investments to maintain liquidity was not required.	Investments – Statement of Financial Position Investments – Cash received – Cash Flow Statement
Investments accounted for under the equity method were less than budget due to the transfer of Novozymes Biologicals Pty Ltd to Held for Sale during the reporting period, and a budgeted investment did not proceed.	Investments accounted for under the equity method – Statement of Financial Position
Other investments were less than budget due to the assumption when preparing the budget that an R&D investment was capital in nature, but was subsequently determined to be an expense.	Other investments – Statement of Financial Position
Land and Buildings were less than budget due to the decision by senior management subsequent to preparing the budget to sell the land and buildings (therefore requiring these to be transferred to Held for Sale during the current reporting period) and a revaluation decrement made at 30 June 2014 which had not been budgeted for. This was partially offset by the incorrect classification of leasehold improvements as property, plant and equipment in the budget as discussed below.	Land and buildings – Statement of Financial Position
Property, plant and equipment was less than budget due to the classification of leasehold improvements as plant and equipment in the budget rather than land and buildings. Also, the amount of leasehold improvements was overestimated compared to actual costs incurred.	Property, plant and equipment – Statement of Financial Position



## Note 19: Budgetary Reports and Explanations of Major Variances *(continued)*

### Note 19B – Departmental Major Budget Variances for 2015 *(continued)*

Explanation of major variances	Affected line items (and statement)
Other non-financial assets were higher than budget largely due to the accrual of royalties – it had been anticipated that these would be received during the year rather than accrued-for.	Other non-financial assets – Statement of Financial Position
Assets Held for Sale were more than budget because no decisions regarding the sales of the land and buildings or Novozymes Biologicals Pty Ltd had been made at the time the budget was prepared.	Assets held for sale – Statement of Financial Position
Suppliers were more than budget due to a higher-than expected R&D spend, and more projects requiring funds to be accrued than anticipated, due to delays in making project payments. As a result of the increase in the amount accrued this year, supplier payments were less than budget.	Suppliers – Statement of Financial Position Suppliers – Cash Flow Statement
Other payables (unearned grant income) were more than budget due to an unanticipated grant received from the Department of Agriculture during the period – the expenses associated with this grant had not been made at 30 June 2015.	Other payables – Statement of Financial Position
Other provisions were more than budget due to the omission in the budget of the lease incentive.	Other provisions – Statement of Financial Position
The asset revaluation reserve was less than budget due to the unexpected revaluation decrements recognised for land and buildings and plant and equipment at 30 June 2014. This was partly offset by the revaluation increments recognised during the reporting period for land and buildings.	Asset Revaluation Reserve – Statement of Changes in Equity
Please refer to the explanations of major Statement of Comprehensive Income variances regarding the operating deficit variance.	Operating deficit for the period – Statement of Changes in Equity
The transfers between equity components were more than budget due to a subsequent decision by senior management to increase the R&D expenditure budget for 2015-16. The contracted research reserve is equal to 55% of the following year's R&D expenditure budget.	Transfers between equity components – Statement of Changes in Equity
Grant monies received was more than budget due to the receipt of an unanticipated additional grant from the Department of Agriculture (recognised as unearned income at 30 June) during the period.	Grant income – Cash Flow Statement
Net GST received was less than budget due to supplier payments being less than anticipated.	Net GST received – Cash Flow Statement
Other cash received was more than budget due to royalty income and project refunds being higher than anticipated, and a decrease in accrued royalty income between 2013-14 and 2014-15.	Other cash received – Cash Flow Statement
Purchase of property plant and equipment was more than budget due to the deferral of the majority of leasehold improvement expenditure to this reporting period (it had been budgeted to occur in 2013-14).	Purchase of property, plant and equipment – Cash Flow Statement



# APPENDICES



Jay Collins, from Morawa, Western Australia. Photo: Nicole Baxter

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# Appendix A – Expenditure on government research priorities

In 2014–15, the Australian Government R&D priorities linked to the GRDC’s RD&E investments were the Rural R&D Priorities, announced in May 2007, and the Strategic Research Priorities, announced in June 2013. These priorities are detailed in Table A1.

In May 2015, the Strategic Research Priorities were replaced by the Science and Research Priorities. The Science and Research priorities will be embedded in the GRDC’s annual operational plan for 2016–17 and reflected in that year’s annual report.

**Table A1: Australian Government research priorities**

Strategic Research Priorities	
Challenge	Priority
Living in a changing environment.	1.1 Identify vulnerabilities and boundaries to the adaptability of changing natural and human systems.
	1.2 Manage risk and capture opportunities for sustainable natural and human systems.
	1.3 Enable societal transformation to enhance sustainability and wellbeing.
Promoting population health and wellbeing.	2.1 Optimise effective delivery of health care and related systems and services.
	2.2 Maximise social and economic participation in society.
	2.3 Improve the health and wellbeing of Aboriginal and Torres Strait Islander people.
Managing our food and water assets.	3.1 Optimise food and fibre production using our land and marine resources.
	3.2 Develop knowledge of the changing distribution, connectivity, transformation and sustainable use of water in the Australian landscape.
	3.3 Maximise the effectiveness of the production value chain from primary to processed food.
Securing Australia’s place in a changing world.	4.1 Improve cybersecurity for all Australians.
	4.2 Manage the flow of goods, information, money and people across our national and international boundaries.
	4.3 Understand political, cultural, economic and technological change, particularly in our region.
Lifting productivity and economic growth.	5.1 Identify the means by which Australia can lift productivity and economic growth.
	5.2 Maximise Australia’s competitive advantage in critical sectors.
	5.3 Deliver skills for the new economy.
Rural R&D Priorities	
Priority	Goal
Productivity and adding value.	Improve the productivity and profitability of existing industries and support the development of viable new industries.
Supply chain and markets.	Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the supply chain, including to consumers.
Natural resource management.	Support effective management of Australia’s natural resources to ensure primary industries are both economically and environmentally sustainable.
Climate variability and climate change.	Build resilience to climate variability and adapt to and mitigate the effects of climate change.
Biosecurity.	Protect Australia’s community, primary industries and environment from biosecurity threats.
Supporting the Rural R&D Priorities	
Innovation skills.	Improve the skills to undertake research and apply its findings.
Technology.	Promote the development of new and existing technology.





The following tables summarise the total expenditure allocated against the Australian Government's Strategic Research Priorities and Rural R&D Priorities within the 2014–15 financial year. The allocation of funds is shown in both dollar and percentage terms for each investment theme.

**Table A2: Australian Government Strategic Research Priorities, dollar and percentage values**

	Living in a changing environment			Promoting population health and wellbeing			Managing our food and water assets			Securing Australia's place in a changing world			Lifting productivity and economic growth			Other <sup>a</sup>	Total <sup>b</sup>
	1.1	1.2	1.3	2.1	2.2	2.3	3.1	3.2	3.3	4.1	4.2	4.3	5.1	5.2	5.3		
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
1 Meeting market requirements	-	0.07	-	-	-	-	-	-	18.37	-	-	-	-	-	-	-	18.44
2 Improving crop yield	-	-	-	-	-	-	36.10	-	-	-	-	-	-	-	-	-	36.10
3 Protecting your crop	-	-	-	-	-	-	41.94	-	-	-	7.27	-	0.12	-	-	-	49.33
4 Advancing profitable farming systems	-	-	-	-	-	-	0.10	-	-	-	-	-	36.02	-	-	-	36.12
5 Improving your farm resource base	-	4.57	-	-	-	-	9.61	0.46	-	-	-	-	-	-	-	-	14.64
6 Building skills and capacity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9.92	0.01	9.93
Foundational activities	-	-	-	-	-	-	0.79	-	-	-	-	-	-	-	1.06	24.32	26.17
R&D management	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3.37	3.37
<b>Total</b>	-	<b>4.64</b>	-	-	-	-	<b>88.54</b>	<b>0.46</b>	<b>18.37</b>	-	<b>7.27</b>	-	<b>36.14</b>	-	<b>10.98</b>	<b>27.70</b>	<b>194.10</b>
	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%	%
1 Meeting market requirements	-	0.04	-	-	-	-	-	-	9.46	-	-	-	-	-	-	-	9.50
2 Improving crop yield	-	-	-	-	-	-	18.60	-	-	-	-	-	-	-	-	-	18.60
3 Protecting your crop	-	-	-	-	-	-	21.62	-	-	-	3.74	-	0.06	-	-	-	25.42
4 Advancing profitable farming systems	-	-	-	-	-	-	0.05	-	-	-	-	-	18.56	-	-	-	18.61
5 Improving your farm resource base	-	2.35	-	-	-	-	4.95	0.24	-	-	-	-	-	-	-	-	7.54
6 Building skills and capacity	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5.11	-	5.11
Foundational activities	-	-	-	-	-	-	0.40	-	-	-	-	-	-	-	0.55	12.53	13.48
R&D management	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1.74	1.74
<b>Total</b>	-	<b>2.39</b>	-	-	-	-	<b>45.62</b>	<b>0.24</b>	<b>9.46</b>	-	<b>3.74</b>	-	<b>18.62</b>	-	<b>5.66</b>	<b>14.27</b>	<b>100.00</b>

1.1: Identify vulnerabilities and boundaries to the adaptability of changing natural and human systems; 1.2: Manage risk and capture opportunities for sustainable natural and human systems; 1.3: Enable societal transformation to enhance sustainability and wellbeing; 2.1: Optimise effective delivery of health care and related systems and services; 2.2: Maximise social and economic participation in society; 2.3: Improve the health and wellbeing of Aboriginal and Torres Strait Islander people; 3.1: Optimise food and fibre production using our land and marine resources; 3.2: Develop knowledge of the changing distribution, connectivity, transformation and sustainable use of water in the Australian landscape; 3.3: Maximise the effectiveness of the production value chain from primary to processed food; 4.1: Improve cyber security for all Australians; 4.2: Manage the flow of goods, information, money and people across our national and international boundaries; 4.3 : Understand political, cultural, economic and technological change, particularly in our region; 5.1: Identify the means by which Australia can lift productivity and economic growth; 5.2: Maximise Australia's competitive advantage in critical sectors; 5.3: Deliver skills for the new economy.

a Other includes a joint rural R&D corporation program on farm health and safety and a number of investments that relate to commercialisation.

b Total does not include investments covering emerging issues, innovation investments, project variation or share write-downs.

**Table A3: Australian Government Rural R&D Priorities, dollar and percentage values**

Rural R&D Priorities	Productivity and adding value	Supply chain and markets	Natural resource management	Climate variability and climate change	Biosecurity	Innovation skills	Technology	Other <sup>a</sup>	Total <sup>b</sup>
	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m	\$m
Theme 1—Meeting market requirements	8.20	8.31	0.00	0.01	1.41	0.38	0.03	0.10	18.44
Theme 2—Improving crop yield	25.38	1.59	2.85	2.09	2.39	1.62	0.18	0.00	36.10
Theme 3—Protecting your crop	19.01	0.43	1.41	0.00	28.04	0.31	0.00	0.13	49.33
Theme 4—Advancing profitable farming systems	29.99	0.00	3.61	0.18	1.08	0.88	0.00	0.38	36.12
Theme 5—Improving your farm resource base	5.19	0.10	6.00	3.08	0.20	0.00	0.07	0.00	14.64
Theme 6—Building skills and capacity	2.22	0.00	0.00	0.00	0.13	7.38	0.00	0.20	9.93
Foundational activities	15.06	0.00	1.27	0.64	1.50	7.54	0.00	0.16	26.17
R&D management	1.15	0.10	0.00	0.00	0.00	0.63	0.07	1.42	3.37
<b>Total</b>	<b>106.20</b>	<b>10.53</b>	<b>15.14</b>	<b>6.00</b>	<b>34.75</b>	<b>18.74</b>	<b>0.35</b>	<b>2.39</b>	<b>194.10</b>
	%	%	%	%	%	%	%	%	%
Theme 1—Meeting market requirements	4.23	4.28	0.00	0.00	0.73	0.20	0.01	0.05	9.50
Theme 2—Improving crop yield	13.07	0.82	1.47	1.08	1.23	0.84	0.09	0.00	18.60
Theme 3—Protecting your crop	9.79	0.22	0.73	0.00	14.44	0.17	0.00	0.07	25.42
Theme 4—Advancing profitable farming systems	15.45	0.00	1.87	0.09	0.56	0.45	0.00	0.19	18.61
Theme 5—Improving your farm resource base	2.68	0.05	3.08	1.59	0.10	0.00	0.04	0.00	7.54
Theme 6—Building skills and capacity	1.14	0.00	0.00	0.00	0.07	3.80	0.00	0.10	5.11
Foundational activities	7.76	0.00	0.65	0.33	0.77	3.88	0.00	0.09	13.48
R&D management	0.59	0.05	0.00	0.00	0.00	0.32	0.04	0.74	1.74
<b>Total</b>	<b>54.71</b>	<b>5.42</b>	<b>7.80</b>	<b>3.09</b>	<b>17.90</b>	<b>9.66</b>	<b>0.18</b>	<b>1.24</b>	<b>100.00</b>

a Other includes a joint rural R&D corporation program on farm health and safety and a number of investments that relate to commercialisation.

b Total does not include investments covering emerging issues, innovation investments, project variation or share write-downs.



# Appendix B – GRDC projects

## Summary of GRDC project expenditure (\$)

Project	Expenditure (\$)
Theme 1 – Meeting market requirements	18,441,603
Theme 2 – Improving crop yield	36,100,752
Theme 3 – Protecting your crop	49,332,948
Theme 4 – Advancing profitable farming systems	36,116,679
Theme 5 – Improving your farm resource base	14,643,655
Theme 6 – Building skills and capacity	9,933,032
Foundational activities	26,167,351
R&D management	3,370,768
<b>Total</b>	<b>194,106,788</b>

Theme 1 – Meeting market requirements		Expenditure \$
AEG00002	Australian Export Grains Innovation Centre	5,150,000
AEG00003	Research capacity in barley malting and brewing	70,000
AEG00005	Objective market intelligence on the Indonesian and South-East Asian wheat markets	235,160
AEG00006	Foundation: Market intelligence for Meeting Market Requirements Theme	689,474
APL00002	Co-funding contribution: Coordinator for feed grain research and development partnership	8,714
BA00007	Pilot brewing for malting barley lines	73,600
BRI00042-1	Wheat classification variety operations – Run-off insurance expenses	1,045
BWD00026	Australian prime hard variety trial – Birchip	4,658
CFF00003	Elimination of pre-harvest sprouting in wheat	391,479
CFF00004	Australian prime hard variety trial – Evaluation	100,000
CSP00144	Genetic analysis of wheat quality using MAGIC (multiparent advanced generation intercross) populations	690,000
CSP00145	Omega-3 canola collaborative research project	900,000
CSP00151	New knowledge and tools to manage food and feed harvest quality	40,000
CSP00167	Crop Biofactories Initiative 3	1,800,000
CSP00190	Altering content of canola seed	487,300
CSP00196	Commercialisation of barley for malt and beer	180,000
DAN00139	Improving food quality and end-use market acceptance of Australian pulses – Cooking and sensory	8,333
DAN00196	Eliminating grain defects in chickpeas	4,993
DAQ00195	Australian prime hard variety trial – Northern Region	17,299
DAS00135	National surveillance of grains to manage food and feed safety market risks – Node C	120,000
DAS00152	Intellectual Property Sub-Licence and Materials Supply Agreement	162,969
DAS00153	Australian prime hard variety trial – South Australia	63,500
DAV00132	Objective high-throughput technologies for the pulse industry	180,000
DAW00220	Barley grain defects – Research and screening services	266,000
FAR00003	Hyperyielding cereals – A feed grain initiative	340,000
FVL00002	Licence agreement	97,173



Theme 1 – Meeting market requirements		Expenditure \$
GGL00003	Evaluating the quality of competitor varieties in Australian wheat export markets	177,540
GOG00007	Grains and Legumes Nutrition Council—Membership subscription	100,000
GOG00008	Grains and Legumes Nutrition Council—Health and nutrition	250,000
KAL00005	Australian prime hard variety trial—Western Australia	19,600
KG200001	Stored grain survey	20,000
MCM00001	Coordination of registration of grain storage chemicals and codex attendance	54,250
MPC00008	Assessment of options for phenotypic testing for late maturity alpha-amylase	24,200
NCA00011	National grain end point royalty reporting and analysis	125,000
NCA00012	Investigation of the durum industry—Path to market and fit to market requirements	11,000
NPB00013	Plant Biosecurity CRC—Grain Storage Research and Development Program	1,500,000
PAD00001	Improving on-farm grain storage management practices through technical training and extension	685,184
QUT00005	New technology for stored grain pest management	9,831
QUT00006	New technology for stored grain pest management—Phase 2	303,882
UA00126	Increasing malt extract and the export competitiveness of Australian barley	350,000
UA00130	Pre-harvest sprouting resistance in wheat	170,000
UA00131	Black point in wheat	40,600
UA00132	Yellow pigments in wheat and wheat-based end-products	140,000
UA00133	Late maturity alpha-amylase in wheat	395,000
UA00135	Improved functionality of grain storage products	299,975
UA00150	Late maturity alpha-amylase: A molecular marker based, high-throughput, precise screening protocol	634,714
UMU00043	Novel glutenin subunits for extra functionality to Australian wheat cultivars	239,636
UQ00077	A genetics x environment characterisation of the risk for late maturity alpha-amylase across the main wheat producing shires of Australia	145,148
UT00031	Development of a quantitative polymerase chain reaction based test for premature yeast flocculation	109,782
WCA00003	Pilot Malting Australia—Commercial malting validation	57,200
WJM00005	Coordination of registration of grain storage chemicals and codex attendance	85,542
WQA00002	Wheat variety classification services	411,821
<b>THEME 1 – MEETING MARKET REQUIREMENTS TOTAL</b>		<b>18,441,603</b>

Theme 2 – Improving crop yield		Expenditure \$
ACP00002-Q	Australian Centre for Plant Functional Genomics Phase II	2,790,000
AMC00017	Managed environment facility research implementation coordinator	42,611
AMC00018	Frost Steering Committee consultancy agreement	7,500
ANU00020	The generation of wheat cultivars with improved drought tolerance	149,992
ANU00021	Molecular tools for the modulation of transpiration efficiency in wheat	260,000
ANU00023	Plants better adapted to moisture stress and increased soil strength	260,000
ANU00024	Identification of superior Rubiscos in wheat relatives and introgression into elite wheat	500,000
BBC00007	National frost initiative	90,000
BWD00022	Crop variety extension in Victoria	36,500
CBC00001	Frost Steering Committee consultancy agreement	3,607
CFF00008	Assessment of leaf area index, tiller survival and short delay in flowering as candidate traits for tolerance to early drought in wheat	14,750



Theme 2—Improving crop yield		Expenditure \$
CIM00018	Identification and utilisation of novel sources of resistance to crown rot and the root-lesion nematodes in adapted spring and durum wheat	447,627
CIM00019	Enhanced delivery of CIMMYT germplasm to Australia	100,000
CIM00020	Focused improvement of durum wheat germplasm from CIMMYT for yield potential, drought and biotic constraints	149,350
CSA00027	Adding value to GRDC's National Variety Trials network	32,000
CSA00041	Better irrigated wheat germplasm	354,608
CSE00060	Literature review on the impact of heat	15,000
CSP00143	New strategies for phenotyping reproductive stage frost and chilling tolerance in wheat	300,000
CSP00148	High-throughput and remote trait measurement	310,000
CSP00156	Engagement of the national managed environment facility in validation and delivery of key physiological traits for improved wheat performance under drought	333,000
CSP00157	Australian Soybean Breeding Program	500,000
CSP00168	Photosynthesis traits for raising wheat yield potential	450,000
CSP00173	Barley overgrowth alleles for breeding	130,000
CSP00175	Maintaining wheat grain number under reproductive-stage drought conditions	340,000
CSP00179	Raising water productivity: Trait assessment for Australian rainfed wheat	300,000
CSP00180	Maintaining yield stability of wheat under spring frosts	395,000
CSP00183	Pedigree-based association genetic analysis of wheat phenology	343,906
CSP00185	Collection, phenotyping and exploitation of wild <i>Cicer</i> genetic resources for chickpea improvement	339,432
CSP00197	Frost Steering Committee consultancy agreement	7,500
CSP00199	Validation trials for dwarfing genes, vigour x management interactions, and preliminary assessment of rate of grain-filling	300,000
CSP00200	Improving wheat yields by increasing coleoptile length and water productivity	200,000
CUR00024	Genetics of wild germplasm, gene-pool expansion and integrated assisted single seed descent approach to enhance adaptive potential in chickpea	471,094
DAN00108	National Brassica Germplasm Improvement Program	390,000
DAN00117	Development of molecular markers for application in Australian canola breeding	865,000
DAN00151	Pulse Breeding Australia—Chickpea National Breeding Program	1,300,000
DAN00153	Northern New South Wales safflower evaluation and seed increase	149,966
DAN00157	Evaluating remaining albus lupin breeding material at Wagga Wagga	40,000
DAN00162	Evaluation of durum material in managed environment facilities	35,000
DAN00163	Durum Breeding Australia	1,200,000
DAN00178	Curation of mapping populations—Barley and wheat	225,000
DAN00190	Quarantine of cereals and pulses	95,000
DAQ00172	National Mungbean Improvement Program	300,000
DAQ00185	Barley germplasm progression—Northern Region	354,929
DAS00120	Pulse germplasm enhancement—National coordination	25,000
DAS00121	Pulse germplasm enhancement—Abiotic stresses	250,000
DAS00129	National Oat Breeding Program—Healthy and productive grain varieties for the future	1,011,085
DAS00140	Improving yield and reliability of field peas and chickpeas under water deficit	150,000
DAS00148	Australian Pastures Genebank	122,410
DAS00149	Vetch varieties for grain and hay production for Australian farmers	65,380



Theme 2—Improving crop yield		Expenditure \$
DAV00085	Australian canola germplasm enhancement	345,000
DAV00118	Pulse Breeding Australia—Field Pea Breeding Program	1,000,000
DAV00119	Pulse Breeding Australia—Lentil Breeding Program	811,541
DAV00126	Molecular markers for pulse-breeding programs	750,000
DAV00127	Using next-generation genetics to accelerate variety improvement in bread wheat, durum and barley	395,571
DAV00131	Australian Grains Genebank—Phase 2	1,000,000
DAV00134	Diagnostic services for pulse germplasm enhancement and breeding programs	61,289
DAW00215	Characterising water deficit and benchmarking genetic diversity in wheat for key adaptive traits at Merredin, Yanco and Narrabri managed environment facilities	295,000
DAW00219	Characterising and exploiting genetic diversity in wheat and barley for tolerance to water deficit during germination and crop establishment	120,000
DAW00234	Determining yield under frost—One degree at a time	250,000
DAW00240	Manipulating barley phenology to maximise yield potential	400,000
ERC00001	Frost Steering Committee consultancy agreement	3,117
FWC00002	Coordinator for Pulse Breeding Australia	18
FWC00005	Coordinator for Pulse Breeding Australia	21,180
GIM00001	Grains industry market access facilitation project	125,000
GLC00001	Frost Steering Committee consultancy agreement	4,969
HCP00001	Extension of winter crop variety information in Queensland	34,061
HWC00001	Scope and develop research areas: The employment of genetic solutions for heat tolerance in wheat	65,000
ICA00010	Mining the ICARDA germplasm collection for biotic and abiotic priority traits	136,350
ICA00011	Pre-emptive chickpea pre-breeding for biotic stresses and germplasm enhancement for abiotic stresses	198,141
ICA00012	Focused improvement of ICARDA/Australian durum germplasm for abiotic tolerance	150,000
ICA00013	Improving heat tolerance of wheat	179,801
ICA00014	Application of focused identification of germplasm strategy in Australian environment	236,820
ICY49-1	National Frost Initiative—Expenses	9,036
ICY63-1	Development of GRDC strategic initiative in heat stress	3,702
IGP00004	Evaluation of barley-breeding lines in the Northern Region	656,903
JOL00008	Water productivity traits strategy	18,813
JPA00003	Development of GRDC strategic initiative in heat stress	44,717
KAL00004	Extension of winter crop variety information in Western Australia	35,000
NFC00002	Frost Steering Committee consultancy agreement	7,500
PCA00001	Australian Peanut Genetic Improvement Program	380,000
PRC00001	Frost Steering Committee consultancy agreement	7,500
RDEM6-1	Development of data sources for evaluation and reporting of progress in GRDC investment themes	107,182
RDEM7-1	G20 Wheat Initiative	15,221
RTA00001	GRDC Frost Initiative—Steering Committee	3,750
SHE00011	GRDC Frost Initiative—Steering Committee	5,966
SKC00002	National Frost Initiative	46,033
UA00127	Pulse Breeding Australia—Australian Faba Bean Breeding Program	1,051,286



Theme 2—Improving crop yield		Expenditure \$
UA00136	Australian National Frost Program—Coordination and phenotyping	500,000
UA00143	Australian Wheat and Barley Molecular Marker Program—Genetic analysis	1,000,000
UA00145	Development of salinity-tolerant wheat and barley	934,805
UA00152	Genomic selection: Development and utilisation in a commercial wheat-breeding program	60,000
UA00160	Australian Research Council Industrial Transformation Research Hubs: Genetic diversity and molecular breeding for wheat in a hot and dry climate	1,500,000
UM00045	Expanding the brassica germplasm base through collaboration with China and India	300,000
UMU00037	International Wheat Genome Sequencing Consortium assembly of chromosome 7A	200,000
UMU00038	Improved adaptation of barley to acid soils	200,000
UMU00039	Validating the role of the wheat 1-FEH gene in stem water-soluble carbohydrate remobilisation to the grain	172,200
UMU00046	Improved adaptation of barley to acid soils	200,000
UMU00048	Genetic approaches to reduce the nitrogen dilution effect and increase nitrogen-use efficiency in wheat	800,000
UQ00064	StressMaster: A decision support tool to manage irrigation in real time in managed environments	250,000
UQ00068	Delivery of wheat root traits that contribute to water-limited yield stability	284,984
UQ00070	Sorghum Core Pre-breeding Program	750,000
UQ00071	Frost situation analysis	293,552
UQ00073	National barley coordination project	149,926
US00049	National Triticale Improvement Program	46,800
US00056	Research Project 1: Superior water-use efficiency through improved mesophyll conductance	89,055
US00057	Identification of genetic variation for heat tolerance in wheat germplasm of relevance to the northern grains region	349,313
US00058	Capacity building to support research and plant breeding at the I.A. Watson Grains Research Centre	319,920
US00059	Research Capacity Building: GRDC Senior Lectureship in Agronomy/Plant–Soil–Microbe Interactions	178,794
US00060	Research Capacity Building: GRDC Senior Lectureship in Plant Physiology	178,794
US00061	Exploring beneficial genotype, environment and management interactions for crop yield: Effects on soil health	212,660
US00068	A novel mutation-based strategy to increase seed yield in canola	242,041
US00072	Evaluation of wheat germplasm derived from Indian materials for specific traits of importance to the Australian cropping environment	40,000
US00073	Exploitation of international grains in Australia: Coordinated importation, quarantine and evaluation, data management and communication	280,320
UT00024	The role of canopy architecture in improving the water-limited yield of wheat lines contrasting in the 'tin' gene	67,000
UT00027	Transpirational control and oxidative stress tolerance traits as components of salinity stress tolerance in cereals	200,159
UWA00151	Unleashing the power of genomics for lupin marker development and crop improvement	175,000
UWA00159	Tools for accelerated breeding and screening for abiotic stress in grain legumes	249,987
VIT00001	Juncea canola development for Australia	300,000
YOU00002	Focused identification of germplasm strategy (FIGS program)	47,727
<b>THEME 2—IMPROVING CROP YIELD TOTAL</b>		<b>36,100,752</b>



Theme 3—Protecting your crop		Expenditure \$
AMC00016	Development of yield response curves for cereal foliar and root and crown pathogens	26,925
ANU00016	Characterisation of effector proteins from necrotrophic fungal wheat pathogens	259,990
ARN00001	Support of the Australian Glyphosate Sustainability Working Group	20,000
BGC00002	Improving spray drift management workshops	574,000
CES00002	Beet western yellows virus outbreak 2014—Aphid insecticide resistance screening	110,000
CES00003	Aphid and insecticide resistance management in oilseed and pulse crops	400,000
CIM00017	Australian Cereal Rust Control Program – CIMMYT delivery of resistant germplasm and surveillance for resistance in Australian cultivars	300,000
CRA00003	Pre-breeding cultivar screening for field tolerance to crown rot	87,000
CSA00043	Impact of weeds on Australian grain production and adoption of no-till cropping practices	118,598
CSE00059	New knowledge to improve the timing of pest management decisions in grain crops	49,556
CSP00149	Develop new crown rot resistant barley germplasm	231,264
CSP00154	Functional analysis of the genome of the major crown rot pathogen	230,000
CSP00155	Reverse genetics for the development of wheat cultivars with improved resistance to necrotrophic pathogens	300,000
CSP00161	Triple rust resistance project—Australian Cereal Rust Control Program	1,490,000
CSP00162	Inducing suppression of fusarium crown rot complexes	499,193
CSP00164	Australian Cereal Rust Control Program—Molecular marker program CSIRO—University of Sydney—CIMMYT collaborative project	703,440
CUR00016	Australian Centre for Necrotrophic Fungal Pathogens—Fungicide benchmarks	192,925
CUR00019	Fungicide evaluation of new-generation actives in cereals and pulse crops	115,532
CUR00020	Managing on-farm biosecurity risk through pre-emptive breeding: The case of rust in field pea and lentil	150,000
CUR00022	Fungicide resistance management strategy and communications	99,978
CUR00023-BA	Centre for Crop and Disease Management	5,004,046
DAN00140	New tools and germplasm for Australian pulse-breeding programs to respond to changing virus threats	100,000
DAN00142	Differential herbicide tolerance of winter crops in south-eastern Australia—Stage 3	195,000
DAN00172	Managing crop disease—Improving chickpea pathogen resistance	260,000
DAN00174	Managing on-farm biosecurity risk in wheat through pre-emptive breeding	325,000
DAN00175	National crown rot epidemiology and management program	964,996
DAN00176	Northern New South Wales integrated disease management	325,000
DAN00177	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease—Southern New South Wales	339,125
DAN00179	Scoping study on canola viruses in northern Australia: Occurrence and variety performance	60,000
DAN00188	eXtensionAUS—Crop nutrition pilot	173,750
DAN00202	New tools and germplasm for Australian pulse and oilseeds breeding programs to respond to changing virus threats	447,999
DAN00204	Conventional insecticide resistance in helioverpa—monitoring, management and novel mitigation strategies in Bollgard	75,000
DAQ00164	Biological suppression of root-lesion nematodes in grain-growing soils	50,000
DAQ00167	Germplasm enhancement for crown rot resistance in winter cereals	252,428
DAQ00171	Genetic options for nematode control	491,150
DAQ00179	Integrated pest management training	209,917



Theme 3—Protecting your crop		Expenditure \$
DAQ00186	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease	700,355
DAQ00187	National barley foliar pathogen variety improvement program	1,150,000
DAQ00190	Maintaining a barley pre-breeding capability in Queensland	200,000
DAQ00191	Sorghum Midge Testing Scheme	13,431
DAQ00196	Delivery of improved invertebrate pest management in the northern grains region	549,521
DAQ00197	Cultural management options for herbicide-resistant weeds	154,100
DAS00094	Diamondback moth control and insecticide resistance management	15,000
DAS00100	Herbicide tolerance screening in the Southern Region with national coordination	195,000
DAS00111	DNA tests for nematode community analysis	80,000
DAS00116	Genetic options for nematode control in the Southern Region	300,000
DAS00125	Fungicide control of <i>Rhizoctonia</i> —Part A	306,741
DAS00131	Improving weed management in pulse crops through herbicide tolerance—Part B	328,000
DAS00132	Improving weed management in pulse crops through herbicide tolerance—Part A	40,000
DAS00133	Improved resistance to oat pathogens and abiotic stress management	300,000
DAS00134	Improved management of snails and slugs	567,694
DAS00136	New fungicide technologies for crown rot management	150,000
DAS00137	National improved molecular diagnostics for disease management	400,000
DAS00139	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease—South Australia	360,000
DAS00141	Managing crop disease—Improving cereal root disease resistance supplement	150,000
DAS00144	Competitive ability evaluation of wheat and durum varieties	80,000
DAS00151	Beet western yellows virus outbreak 2014—Coordination, communication and forensic analysis	185,000
DAS00154	White grain disorder in wheat	132,553
DAS00155	Diamondback moth control and insecticide resistance management	280,660
DAV00117	Pulse Germplasm Enhancement Program—Resistance to biotic stresses	300,000
DAV00123	Victorian field crop nematology project	214,321
DAV00128	National nematode epidemiology and management program	815,025
DAV00129	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease in Victoria	245,000
DAV00138	eXtensionAUS—Field crop diseases learning network	57,500
DAW00191	Evaluating herbicide tolerance of new crop varieties in Western Region with national coordination	192,000
DAW00206	Germplasm enhancement for yellow spot resistance in wheat	300,016
DAW00209	Genetic options for the management of root-lesion nematode species in Western Australia	100,000
DAW00228	National pathogen management modelling and delivery of decision support	665,788
DAW00229	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease—Western Australia	771,004
DAW00230	PestFax Map II—National	152,250
DAW00231	Management of spray drift through inversion risk awareness	141,796
DAW00245	Yield loss response curves for host resistance to leaf, crown and root diseases in wheat and barley	950,000
DAW00247	Improved genetic solutions for management of yellow spot in wheat	754,530
DEP00002	Push notifications to enable proactive management of pests, weeds and diseases	70,000
FAR00002	Improved fungicide use for cereal rust control	100,000



Theme 3—Protecting your crop		Expenditure \$
GTL00002	Endophyte cereals	450,000
GWC00004	Australian Cereal Rust Control Program—Commercialisation scoping studies	34,703
HIP00001	Herbicide innovation partnership	4,500,000
IAC00002	Surveillance and forecasts for mouse outbreaks in Australian cropping systems	299,951
IAC00003	Development of a new rodenticide	350,000
ICN00016	Integrated weed management extension Northern Region	120,423
ICN00019	Scoping training needs and efficient delivery pathways for adviser training with a focus on crop protection training	139,050
ICN00020	Current invertebrate pest management options risk matrix	36,416
IMB00001	Insecticidal peptides from natural predators	5,000
LUN00001	Reducing the impact of the parasitic root-lesion nematode on cereal crops	451,517
MCM00002	Post-harvest chemical management project	54,250
ORM00010	Coordination and support services for extension—Pilot project	141,306
PBC00001	Economic analyses of gene deployment strategies for high-priority exotic pests and chemical supply to manage pest incursions	30,578
PBC00002	Extending biosecurity preparedness and surveillance strategies and developing a chemical supply framework for pest incursions	172,694
PBC00003	New tools for field grains surveillance and diagnostics of high-priority pests	311,728
PHA00004	Provision of independent technical and secretarial services to the National Working Party for Pesticide Application	55,000
PHA00010	Development of pre-emptive Australian Pesticides and Veterinary Medicines Authority emergency permits for exotic plant pest incursion containment and control	149,975
PHA00014	Determining equivalent zones of agriculture for the generation of registration data	151,058
PYC40-1	Improving grower knowledge of herbicide tolerance and weed competitiveness of crop cultivars	517
PYC65-1	Improving integrated crop protection extension nationally—Expenses	12,100
QUT00007	A new biopesticide for diamondback moth management in canola	188,926
RDP00008	Provision of independent chair services for the National Integrated Weed Management Initiative	25,000
RDP00011	National coordination of weeds research	80,000
RRR00003	Grain production stewardship modules	86,600
SHE00009	Investment Review	79,631
UA00124	Understanding and management of resistance to Group M, Group L and Group I herbicides—National project	265,000
UA00141	Advancement of new stem genes for stem and leaf rust resistance from uncultivated relatives of wheat	269,990
UA00144	Improved herbicide efficacy and longevity in southern no-till farming systems	149,935
UA00156	Emerging weeds—Seed-bank biology of emerging weeds	581,456
UA00158	Mechanisms, evolution and inheritance of resistance	299,745
UCS00020	Weed management in the Southern Region mixed farming systems—Strategies to combat herbicide resistance	528,261
UCS00021	Biopesticides for the Australian grains industry	61,218
UM00047	Novel, highly targeted, low environmental impact control of pest slugs and snails	137,628
UM00048	National coordination of invertebrate pest research and insecticide resistance management	191,410
UM00049	Management of insecticide resistance in redlegged earth mite and screening new mode of action chemistry	455,000



Theme 3—Protecting your crop		Expenditure \$
UM00050	'Proof of concept' for approaches designed at increasing disease resistance to fungal pathogens of canola	337,200
UM00051	National canola pathology program including new molecular knowledge, pathogen evolution and control technologies	1,147,781
UM00052	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease—National chickpea pathology program	148,866
UM00053	Development of new non-chemical weed control technologies—Microwave control of weeds	245,975
UM00055	Control of grain pest molluscs	150,000
UNE00021	Field trials of attract-and-kill for diamondback moth	190,000
UQ00049	Rapid introgression of crown rot resistance into hexaploid wheat	117,100
UQ00059-DAQ	Herbicide tolerance screening of winter crops in Northern Region—Phase IV	110,000
UQ00062	Improving integrated weed management practice in the Northern Region	450,000
UQ00072	Spray application management (drift reduction technologies modelling, managing surface-temperature inversions and spray quality effects on herbicide efficacy)	159,960
US00054	Crown rot germplasm enhancement for wheat : University of Sydney and SARDI components	443,130
US00063	Australian Cereal Rust Control Program—Durable genes	917,598
US00064	Australian Cereal Rust Control Program—National breeding support	161,690
US00067	Australian Cereal Rust Control Program—Towards 2019 and a century of monitoring cereal rust pathogens in Australia	692,310
USA00010	Mechanical weed seed termination at harvest	350,000
USA00016	The application of bent leg technologies to higher speed tined seeding of cereal grains	25,600
USQ00012	Enhanced germplasm for crown rot in winter cereals through application of molecular markers	130,000
USQ00013	Managing crop diseases—Improving crown rot resistance in durum	220,000
USQ00018	Stubble and weed borne pathogens in winter cereals and pulses in the Northern Region	46,148
UWA00124	Efficacy of the Harrington Seed Destructor in targeting weed seeds during the harvest of Australian grain crops	160,000
UWA00145	Innovative approaches to resistance to necrotrophic pathogens and sap-sucking insect pests	597,031
UWA00146	Australian Herbicide Resistance Initiative—Phase 4	1,150,000
UWA00154	Strategies to provide resistance to the economically important fungal pathogen <i>Rhizoctonia solani</i>	300,000
UWA00155	New chemistry options for wild radish control	299,482
UWA00158	Detection and epidemiology of winter/spring aphids and redlegged earth mites	99,922
UWA00165	Options for improved insecticide and fungicide use and canopy penetration in cereals and canola	199,992
UWA00171	Australian Herbicide Resistance Initiative—Phase 5	1,800,000
UWA00172	WeedSmart—Stage three	118,000
<b>THEME 3—PROTECTING YOUR CROP TOTAL</b>		<b>49,332,948</b>
Theme 4—Advancing profitable farming systems		Expenditure \$
AAM00001	National and international regional crop benchmarking network	112,200
AAM00002	Regional Cropping Solutions Network—Use of variable rate technology and other modelling to improve water use efficiency	9,000
ACC00007	GRDC extension and training program	120,000
AGG00002	Agribusiness Trial Extension Networks: Moisture profiles on sandy soils	26,250
APR00001	Practical financial figures for farm business management	655,000
APT00001	Economics of closing the yield gap in the northern grains region	199,441
BAR00005	Investment Review	19,554



Theme 4—Advancing profitable farming systems		Expenditure \$
BBC00006	Western Australian soils initiative	25,490
BFH00001	Develop the background information, business cases and projects in the farm practices area	24,500
BWD00021	More Profit from Crop Nutrition II—Extension and training Southern Region	96,732
BWD00024	Maintaining profitable farming systems with retained stubble—Victoria and Tasmania	698,335
BWD00025	National paddock survey initiative	1,110,490
CH00001	Regional Cropping Solutions Network—Test innovative, practical and reliable methods for incorporating lime into acidic Wodjil soils	5,000
CLI00001	Undertake work to contribute to the understanding of deep placement of fertiliser	25,000
CMA00002	Assessing forecast and management options for mitigating extreme temperature impacts on grains	180,145
CMA00003	Linking Agricultural Production Systems sIMulator based management tools with Predictive Ocean Atmosphere Model for Australia seasonal forecasts	300,000
CRA00004	Cultivar crown rot tolerance trials	62,455
CRC00004	Improving spray fallow techniques for better moisture conservation, better winter and summer weed control and more profitable grain crops	115,220
CSA00029	National integration of crop sequence strategies and tactics	255,920
CSA00036	More Profit from Crop Nutrition II—Analysis frameworks to support profitable fertiliser use	150,551
CSA00037	More Profit from Crop Nutrition II—Reassessing the value and use of fixed nitrogen	126,483
CSA00039	Better irrigated wheat agronomy	253,012
CSA00042	Web-based visualisation of spatial and temporal yield gap information for grain growers and strategic research investment planning	94,779
CSA00050	Northern farming systems—Integrating research solutions for profitable outcomes	394,728
CSA00052	Desktop study—Water productivity	60,000
CSE00055	Crop sequences to manage soil pathogens and reduce the yield gap of northern grain production	250,000
CSP00146	Facilitating increased on-farm adoption of broadleaf species in crop sequences to improve grain production and profitability	625,425
CSP00160	Refining variety and management recommendations to improve productivity and resource use efficiency of dual-purpose crops in Australia	397,577
CSP00165	More Profit from Crop Nutrition II—Phosphorus use efficiency: Rhizosheath project	52,144
CSP00170	Measuring and managing soil water in Australian agriculture	683,094
CSP00178	Increasing yield and reducing risk through early sowing in the southern grains region—National expansion	250,000
CSP00184	Generating baseline data to identify, quantify and manage soil constraints of the western plains of New South Wales	131,359
CSP00186	Maintaining profitable farming systems with retained stubble—Research support	279,699
CSP00187	Optimised canola profitability—Understanding the relationship between physiology and tactical agronomy management	-458,096
CSP00187-DAN	Optimised canola profitability—Understanding the relationship between physiology and tactical agronomy management	1,708,153
CSP00188	Investment Review	16,854
CSP00194	Whole-farm analysis—Business case	98,902
CWF00020	Overdependence on agrochemicals	150,000
DAN00150	Improving the reliability of sorghum in the western zone	150,000
DAN00152	The strategic use of tillage within conservation farming	399,068
DAN00165	More Profit from Crop Nutrition II—Program coordination and communication	220,000



Theme 4—Advancing profitable farming systems		Expenditure \$
DAN00166	More Profit from Crop Nutrition II—Making better fertiliser decisions for cropping systems in Australia phase 2	195,300
DAN00167	Variety-specific agronomy packages for southern, central and northern New South Wales	810,646
DAN00168	More Profit from Crop Nutrition II—Regional soil-testing guidelines for the Southern Region	149,079
DAN00171	Northern pulse agronomy initiative—New South Wales	374,339
DAN00173	Management of barley and barley cultivars for the Southern Region	519,974
DAN00184	Evaluation and agronomic management of dual-purpose cereal varieties for New South Wales mixed farming systems	62,400
DAN00191	Nitrogen-fixing break crops and pastures for high-rainfall zone acid soils	150,000
DAN00192	Southern New South Wales soybean agronomy project	120,000
DAN00195	Tactical crop agronomy of sorghum and maize in the Northern Region—New South Wales component	182,260
DAN00197	Tactical crop agronomy for selected crops in the Northern Region—Safflower, linseed, sunflower	149,991
DAQ00170	Grower solutions for central Queensland	392,809
DAQ00180	Extension of nitrogen fixation program outputs to end users—Northern Region	60,000
DAQ00181	Optimising nitrogen fixation of grain legumes—Northern Region	119,765
DAQ00183	More Profit from Crop Nutrition II—Extension and training Northern Region	150,000
DAQ00184	Grower solution project for Queensland coastal and inland Burnett and New South Wales north coast	210,000
DAQ00192	Northern farming systems—Integrating research solutions for profitable outcomes	832,000
DAS00119	Profitable crop sequencing in the low-rainfall areas of south-eastern Australia	435,000
DAS00128	Optimising nitrogen fixation of grain legumes—Southern Region	149,973
DAS00145	Maintaining profitable farming systems with retained stubble—Coordination support	59,300
DAS00146	More Profit from Crop Nutrition II—Managing micronutrient deficiencies in cropping systems of eastern Australia	303,592
DAS00147	More Profit from Crop Nutrition II—Benchmarking wheat yield against nitrogen use	260,000
DAS00157	More Profit from Crop Nutrition II—Nitrogen and water interactions	37,880
DAV00113	Expanding the use of pulses in the Southern Region	430,000
DAV00125	More Profit from Crop Nutrition II—Improving nitrous oxide abatement in higher rainfall cropping systems and developing nitrogen response curves	166,667
DAV00141	Optimising the yield and economic potential of high-input cropping systems in the high-rainfall zone	1,249,715
DAW00213	Putting the focus on profitable break crop and pasture sequences in Western Australia	1,060,000
DAW00218	Wheat agronomy—Building system profitability in the Western Region	657,900
DAW00221	Optimising nitrogen fixation of grain legumes—Western Region	128,152
DAW00222	More Profit from Crop Nutrition II—Regional soil-testing and nutrient guidelines: Western Region	97,666
DAW00223	More Profit from Crop Nutrition II—Extension and training Western Region	150,000
DAW00224	Management of barley and barley cultivars in Western Australia	696,296
DAW00227	Tactical break crop agronomy in Western Australia	1,124,457
DAW00239	More Profit from Crop Nutrition II—Managing micronutrient deficiencies in cropping systems of Western Australia	138,788
DAW00241	Farming systems to improve crop tolerance to frost	1,746,172
DAW00244	Delivering enhanced agronomic strategies for improved crop performance on water-repellent soils in Western Australia	1,705,000
DAW00250	Evaluation and report on the effectiveness of yield predicting tools	30,000



Theme 4—Advancing profitable farming systems		Expenditure \$
DAW00253	Early seeding—A climate change adaptation method in the north-east agricultural region of Western Australia	37,500
DER00019	Farm practices survey	105,875
DER00020	A better understanding of the sociological factors influencing the adoption of break crop research	180,000
DMA00003	Agribusiness Trial Extension Networks: Crop response to phosphate fertiliser	18,750
FGI00010	Grain and Graze 3—Western Region	600,000
FUT00001	Case studies to review methods for defining within-paddock management zones—Kwinana West zone	33,000
GOA00001	Grower solutions for central New South Wales	550,000
GPC00001	Extension of nitrogen fixation outputs to end users—Western Region	60,000
GRA00003	Adapting narrow windrow burning to higher yielding no-till systems in southern New South Wales	6,250
GS2-1	Agribusiness Trial Extension Networks: Expenses	12,950
IMA00008	Agribusiness Trial Extension Networks: Cultural impacts on annual ryegrass seed numbers prior to sowing	18,750
KDI00027	Regional Cropping Solutions Network—Soil moisture monitoring techniques	7,000
LEA00003	Agribusiness Trial Extension Networks: Weed master trial paddocks	14,850
LYH00003	Develop monitoring, evaluation, reporting and improvement strategy for the frost initiative	30,000
MDF00001	Reducing variety selection risk through understanding varietal performance with different management packages	14,000
MFM00004	Regional Cropping Solutions Network—Southern Region	265,089
MFM00007	Viable crop and/or pasture legumes for alkaline soils in the high-rainfall zone	49,142
MIG00014	Soil moisture levels under different levels of fallow management	7,000
MIG00015	Improving the understanding of nitrogen use efficiency and soil–water interactions	63,750
MSF00004	Regional Cropping Solutions Network—Fast track project—Scoping of the nature, extent and impact of ‘underperforming’ sandy soils in the low-rainfall crop production zone of GRDC Southern Region	12,707
NCA00008	Improving market signals for GRDC and the grains industry to enhance delivery to customers	121,000
NFA00009	Grower engagement forums	29,260
NGA00003	GRDC grower solutions for northern New South Wales and southern Queensland	1,150,000
NSS00001	Best management practice for sulphur nutrition in Dune Swale landscape	6,250
NZX00001	ProFarmer market and exchange rate feeds for the GRDC website	26,500
PAL00019	Australian broadleaf cropping project	650,000
PFS16-1	Best practice cereal production information audit and cereal agronomy literature reviews in the Northern Region—Expenses	6,689
PLN00010	Soil probes for cheap and accurate soil pH testing	6,000
PLT00002	Investment Review	15,774
POO00001	Agribusiness Trial Extension Networks: Key drivers to production and profitability gains in the Mallee	18,750
PR301-1	Profitable crop sequencing—Expenses	53,854
PRE00001	Regional Cropping Solutions Network—Understanding and managing spatial variation in stored soil moisture for better crop management decisions	16,000
PRE00003	Regional Cropping Solutions Network—Plant available water information and tools for better crop management decisions for Esperance and Albany zone consultants and growers	8,000
RAA00002	Consulting manager—Future farm automation and robotics	58,523
RAI00004	Regional Cropping Solutions Network—Fast track projects—Soil constraints and management options are poorly understood	6,000



Theme 4—Advancing profitable farming systems		Expenditure \$
RDP00013	The integration of technical data and profit drivers for more informed decisions	375,000
RMS00004	Improving nitrogen application decisions in cropping systems using yield prophet and plant available water capacity mapping in the Barmedman area of southern New South Wales	6,250
RPI00009	Maintaining profitable farming systems with retained stubble—Riverine Plains region	46,272
SEP00013	Regional Cropping Solutions Network—Controlled traffic farming benefits—What are the nitrogen dynamics?	7,390
SFS00022	Pastures in crop sequencing for the high-rainfall zone of southern Australia	350,000
SFS00028	Grain and Graze 3—Extension and delivery on mixed farming benefits in the Southern Region	650,000
SFS00029	Potential for nitrification inhibitors and nitrogen timing strategies to improve nitrogen use efficiency by reducing losses	6,250
SYN00006	Regional Cropping Solutions Network—Short and medium term analysis of macro nutrient dollar substitution into lime	10,800
SYN00007	Case study—Economic assessment of soil zonation	24,075
SYN00008	Early seeding—A knowledge gap strategy for very early season starts	24,750
TAP00008	Darling Downs business case	32,000
TRE00001	Agribusiness Trial Extension Networks: Urea spreaders tested through the Accu-spread program	12,281
TRE00002	Agribusiness Trial Extension Networks: Urea spreaders tested through the Accu-spread program	18,711
UA00119	Assessing management options for enhanced soil phosphorus availability using rotations	20,000
UA00138	Extension of nitrogen fixation program outputs to end users—Southern Region	69,960
UA00139	More Profit from Crop Nutrition II—Tactical foliar phosphorus fertilisation of dryland crops	194,956
UA00154	More Profit from Crop Nutrition II—Phosphorus requirements to accompany high nitrogen fertiliser levels	15,340
UA00155	More Profit from Crop Nutrition II—Nutrient stratification and sub-surface soil testing	14,736
UMU00041	More Profit from Crop Nutrition II—Assessing the nutritional benefits of clay amendment and cultivation of sands	185,000
UMU00042	More Profit from Crop Nutrition II—Managing potassium nutrition to alleviate crop stress	151,000
UMU00045	Farming systems to improve crop tolerance to frost: Crop nutrient management	119,054
UNE00020	More Profit from Crop Nutrition II—Quantifying and understanding root variation in winter cereals	482,549
UNE00022	More Profit from Crop Nutrition II—Evaluating testing methods for phosphorus and potassium soil reserves	120,000
UQ00063	More Profit from Crop Nutrition II—Regional soiltesting guidelines for the northern grains region	450,470
UQ00066	More Profit from Crop Nutrition II—Defining nitrogen response surfaces for sorghum and canola in the northern grains region	189,868
UQ00067	Queensland pulse agronomy initiative to increase the reliability and yield of summer and winter pulses	402,920
UQ00074	High-yielding cereal agronomy in the northern grains region	196,748
UQ00075	Tactical crop agronomy for maize and sorghum in the Northern Region	181,940
UQ00078	More Profit from Crop Nutrition II—Deep placement of nutrients	115,001
UQ00079	More Profit from Crop Nutrition II—Organic matter and nutrient availability	100,599
URS00014	Farm practices survey development, support and reporting	22,600
USQ00014	New tools to measure and monitor soil moisture	331,028
USQ00016	The components of risk in farm profit	180,000
UT00026	Optimising cropping practices in mixed farming systems of Tasmania	165,410
UWA00156	More Profit from Crop Nutrition II—Nitrogen fertiliser response curves: Filling the gap for Western Australia	166,667



Theme 4—Advancing profitable farming systems		Expenditure \$
UWA00169	Use of chemicals to increase frost tolerance in Australian crops	112,387
VIC00009	Regional Cropping Solutions Network	135,457
VIC00010	Correct crop sequencing for irrigated double cropping	323,165
VIS00001	Agribusiness Trial Extension Networks: Legume management for economic nitrogen production in the low-rainfall areas of north-west Victoria	18,075
WAN00021	Dry seeding in Western Australia	390,840
YCR00003	Maintaining profitable farming systems with retained stubble—Yorke Peninsula and the Mid North of South Australia	258,333
<b>THEME 4—ADVANCING PROFITABLE FARMING SYSTEMS TOTAL</b>		<b>36,116,679</b>
Theme 5—Improving your farm resource base		Expenditure \$
ACC00008	Soil biology consultation	2,000
ACH00001	The benefit to grain growers from the management of soil biology	87,068
ACT00004	Application of controlled traffic farming in the low-rainfall zone	450,000
AEA00005	Delivering multiple benefit messages—A partnership with natural resource management—Southern Region	210,000
AGJ00001	Soil biology consultation	2,000
AMP00008	Soil biology consultation	2,000
BN00001	Soil constraints Western Region Steering Committee	4,250
COC00001-1	Caring for our Country II	27,494
COR00048	National Agricultural Nitrous Oxide Research Program—Consolidated publication	13,802
CRF00002	Improved management of soil organic matter for profitable and sustainable cropping—Coordination and extension	170,000
CSA00040	Potential soil carbon sequestration in Australian grain regions and its impact on soil productivity and greenhouse gas emissions	25,000
CSA00044	EverCrop: Developing new mixed farming options	750,000
CSA00045	Linking crop protection, weeds and native vegetation management—On-the-ground natural resource management action to benefit grain growers	147,539
CSA00048	Proximal soil sensing for profitable and sustainable farming	80,046
CSA00053	Impacts of climate on low-rainfall and marginal areas	185,000
CSE00056	Bioroutes to urea fertilisers	425,000
CSE00057	Filling the research gap—Achieving least-cost greenhouse gas abatement—Opportunities in Australian grains farms	40,000
CSO00043	Effective characterisation of soil organic carbon in farms for profitable, sustainable cropping and carbon accounting	95,000
CSO00044	Understanding biological farming inputs	253,834
CSP00139	Novel solutions for managing non-wetting soils	253,878
CSP00177	Water balance of conservation farming systems	91,383
CSP00191	Nitrogen inputs by free-living nitrogen-fixing bacteria—Grower messages	50,000
CT00001	Soil constraints Western Region Steering Committee	6,500
CWF00019	Soil acidity and pH management for central west farming districts	80,000
DAF00004-10A	Nitrous Oxide Research Program Phase 2—Managing an integrated, data synthesis and modelling research network for reducing nitrous oxide emissions from Australian soils	5,360
DAN00160	Life cycle assessment for farming systems in New South Wales	150,000
DAN00169	Building resilient and profitable grain-cropping systems through improved knowledge of soil organic carbon fractions and their functionality	300,000



Theme 5—Improving your farm resource base		Expenditure \$
DAN00180	Does increased herbicide use impact on key soil biological processes?	249,918
DAN00186	Identifying national opportunities for grains emissions mitigation and other environmental improvement, using life cycle assessment and the Australian Agricultural Life Cycle Inventory (AusAgLCI) database	500,000
DAN00189	Australian Inoculants Research Group: National independent quality assurance and germplasm maintenance for <i>Rhizobium</i> inoculants	169,910
DAN00206	Innovative approaches to managing subsoil acidity in the southern grain region	1,019,986
DAQ00182	Improved management of soil organic matter for profitable and sustainable cropping	110,000
DAQ00200	Soil constraints initiative—Management of sodic and magnesic soils	475,000
DAV00099	Harnessing the biological potential of Australian cropping soils	119,500
DAV00102	Monitoring soil biology with high-resolution genomic technologies	60,000
DAV00105	Suppressive soils: Can we find a microbial fingerprint using 'omics' technology?	50,000
DAV00106	Managing soil biology to improve nitrogen supply in grain production systems	50,000
DAV00137	Maintaining productivity and quality of wheat under elevated carbon dioxide	1,000,000
DAW00204	Delivering agronomic strategies for water-repellent soils in Western Australia	500,712
DAW00225	Soil organic matter extension and communication in Western Australia	110,000
DAW00236	Soil acidity is limiting grain yield	320,000
DAW00242	Subsoil constraints—Understanding and management	880,000
DAW00243	Minimising the impact of soil compaction on crop yield	554,179
DAW00252	Innovative approaches to managing subsoil acidity in the Western Region	919,981
ECO00012	Delivery of the Managing Climate Variability Program Phase 4—Climate knowledge and communications program	296,350
ICF00008	Soils under an irrigated environment	251,394
LIE00008	Working together to deliver multiple benefit messages to growers through a whole systems approach to soil management	237,400
MCC00011	National Agricultural Nitrous Oxide Research Program—Evaluation of performance	76,000
MCC00015	Soil strategy development	25,296
MCV00013	Temperature extremes and cropping in Western Australia	41,670
MCV00035	Managing Climate Variability Program Phase 4—Program coordinator	60,000
MCV00036	Predictive Ocean Atmosphere Model for Australia seasonal forecast value	243,747
MCV00037	Can advances in mid-term weather forecasts reduce emissions from nitrogen fertiliser?	24,243
MCV00038	Australian CliMate development	22,150
MCV00039	Managing Climate Variability Program Phase 4—Independent chair	10,526
MCV00040	Managing Climate Variability Program Phase 4—Project management committee	536
MCV00041	Improved skill for regional climate in the ACCESS-based Predictive Ocean Atmosphere Model for Australia	281,068
MCV00042	Managing Climate Variability Program Phase 4—Communication support and administration	649
MFR33-1	National Soils Research, Development and Extension Strategy secretariat costs	35,000
MP00001	Soil constraints Western Region Steering Committee	6,000
POL00001	Polymers for improving soil moisture management and cropping productivity	300,000
QK00001	Soil constraints Western Region Steering Committee	6,500
RSS00010	Soil acidity is limiting grain yield—South Australian component	60,000
SFS00026	Soil acidity is limiting grain yield—Southern Victoria component	40,000
SON00001	Soil biology consultation	1,500



Theme 5—Improving your farm resource base		Expenditure \$
TWC00001	Soil constraints Western Region Steering Committee	5,000
UA00115	Improving phosphorus use efficiency in wheat and barley	275,000
UF00008	Beneficial Microbes Program 2—Progressing new microbial products for Australian grain production to commercialisation	350,000
UM00044	Climate change research strategy for primary industries participants agreement	33,750
UMO00004	On-the-go soil moisture monitoring from global positioning system signals during routine farming operations	70,331
UMU00040	Maintenance of rhizobial germplasm resources	40,000
UQ00061	Fertiliser from wastes—Phase II	217,723
UQ00081	Costs of edaphic stress to the Australian grains industry	280,000
US00065	Understanding the molecular basis for desiccation tolerance of rhizobia for improved survival on seed	83,460
UWA00139	Harnessing the nitrogen cycle through novel solutions	20,000
UWA00163	Long-term no-till farming systems	250,024
VAG00001	Soil biology consultation	2,000
<b>THEME 5—IMPROVING YOUR FARM RESOURCE BASE TOTAL</b>		<b>14,643,655</b>
Theme 6—Building skills and capacity		Expenditure \$
ACO00001	Delivery of technical workshops—Understanding National Variety Trials, crop nutrition and water use efficiency	195,000
ACO00004	GRDC education resources	132,527
ACO00008	GRDC capacity building support	11,797
ACO00009	2014 Seed to Store Careers Advisers event	15,113
ACO00010	2014 Seed to Store YouTube clip competition	8,956
ACO00011	GRDC capacity building website and alumni communication support	22,736
ACO00012	GRDC Seed to Store Careers 'More than gumboots and tractors' Careers Advisers Initiative	34,250
ACO00013	2015 Seed to Store YouTube clip competition	19,990
AFL00003	Building capacity to meet the current and future needs of the Australian grains industry	116,200
AFQ00012	Queensland Grain Industry Awards	12,000
AGH00003	Grains industry research scholarships and undergraduate honours scholarship pilot resource publication	18,680
AMP00006	GRDC Emerging Leader Award	15,000
ARL00008	Australian Rural Leadership Program	100,000
ASTA00002	2015 GRDC Support of the National Science Education Conference of the Australian Science Teachers Association	6,000
ATA97	ATA—Students to study at Western Australian College of Agriculture Cunderdin	12,000
ATA98	ATA—Students to study at the Longerenong College Victoria	12,000
ATA99	ATA—Students to study at Tocal College New South Wales	12,000
BAY00002	Youth Ag Summit partnership	20,000
BRE00008	Grains industry research scholarships and undergraduate honours scholarship evaluation	3,025
BSK12-1	Building Skills and Capacity Theme—Capacity-building awards expenses	118
BSK35-1	GRDC alumni events—Invoices	853
CHI00002	GRDC supporting partner of the Career Harvest website	1,000
CQA00001	Extension provider upskilling—Technology adoption	80,000



Theme 6—Building skills and capacity		Expenditure \$
CSP00176	CSIRO Plant Industry Summer Student Program	80,000
DAN00185	Post-doctoral fellow—Soil nutritional chemistry in southern grains farming systems	70,000
DAN00200	Building research capacity in the northern grains region—New South Wales	2,042,500
DAN00201	Building research capacity in the northern grains region—New South Wales	269,967
DAN00205	Recognising and rewarding excellence award	25,000
DAN00209	eXtensionAUS—Crop nutrition community of practice	404,500
DAQ00194	Building research capacity in the northern grains region—Queensland	633,756
DAS00113	Pulse Breeding Australia—PhD improving metribuzin tolerance in lentil	30,000
DAS00142	Traineeships in applied grains research	71,450
DAS00150	Physiology of yield determination in chickpea ( <i>Cicer arietinum</i> L.)	19,000
DAV00143	Improving practices and adoption through strengthening development and extension capability and delivery in the Southern Region—Regional research agronomists	550,000
DAV00146	eXtensionAUS—Field crop diseases community of practice	404,500
DER00021	Understanding grower needs for access to knowledge—Data collection and formation of a GRDC strategy	55,000
GCS10376	CS—International InterDrought-IV Conference	6,364
GCS10858	CS—National Farmers' Federation 2014 National Congress	15,000
GCS10872	CS—65th Australasian Grain Science Conference	1,375
GCS10873	CS—Precision Agriculture in the Upper North	2,000
GCS10874	CS—9th International Wheat Conference	40,000
GCS10875	CS—Southern Region Grower Group Forum	5,000
GCS10876	CS—Innovation in Agriculture—Are we fostering it or smothering it?	1,000
GCS10877	CS—Harvest review	5,000
GCS10878	CS—Victorian Farmers Federation Annual Grains Conference	8,000
GCS10879	CS—Australasian Applied Statistics Conference	7,000
GCS10880	CS—17th Australian Barley Technical Symposium	25,000
GCS10881	CS—Mallee Sustainable Farming Research, Development and Extension Tri-State Forum 2015	5,000
GCS10883	CS—South Australian No-till Farmers Association 17th Annual Conference	5,000
GCS10884	CS—Birchip Cropping Group Main Field Day	5,000
GCS10894	CS—International Society of Root Research 'Roots Down Under' symposium (ISRR-9)	25,000
GCS10895	CS—Society of Precision Agriculture Australia (SPAA) Precision Ag Expo	2,000
GCS10896	CS—WAFarmers Annual Conference	10,000
GCS10898	CS—8th International Conference on Advances in Arachis through Biotechnology and Genomics (AAGB)	4,545
GCS10944	CS—Southern Dirt Techspo	2,000
GCS10945	CS—Queensland Department of Agriculture and Fisheries Hermitage Research Facility Schools Plant Science Competition	3,500
GCS10948	CS—Agricultural Bioscience International Conference	10,000
GCS10949	CS—17th Australian Society of Agronomy Conference	30,000
GCS10950	CS—Australasia–Pacific Extension Network Conference 2015	10,000
GCS10951	CS—TropAg2015	5,000
GCS10957	CS—Tasmanian Farmers and Graziers Association 2015 Major Policy Forum, Dinner and Field Trip	5,000
GCS10958	CS—12th Australasian Plant Virology Workshop	5,000



Theme 6—Building skills and capacity		Expenditure \$
GCS10965	CS—Crop Consultants Australia Cropping Solutions Seminar	2,000
GCS10969	CS—South East Premium Wheat Growers Association Ladies Day	5,000
GCS10970	CS—Talkin' Soil Health—Unearthing Profits	5,000
GCS10983	CS—Society of Precision Agriculture Australia (EXPOS revisited)	4,000
GCS10984	CS—Australian-Italian Collaborative Research in Agriculture: Scientific Symposium in Grape and Wheat Research	5,000
GCS10985	CS—WAFarmers Taking Care of Business, Mukinbudin	3,000
GCS10986	CS—WAFarmers Taking Care of Business, Esperance	4,000
GGA00005	CS—Innovation Generation Conference Partnership	50,000
GIA00003	Capacity building framework for the Western Australian grains industry	199,120
GRS10004	GIRS—(UA) Identifying novel epigenetic components that regulate seed size in a model plant, <i>Arabidopsis</i>	4,524
GRS10026	GIRS—(UA) Assessing management options for enhancing soil phosphorus availability using rotations	13,572
GRS10031	GIRS—(UA) Use of novel wheat (waxy durum) in baking applications	6,786
GRS10042	GIRS—(CUR) The integration and validation of precision management tools for mixed farming systems	4,524
GRS10044	GIRS—(UA) Evaluating the salt tolerance of transgenic wheat and barley	-268
GRS10248	GIRS—(US) Regulation and long-distance movement of nutrient starvation-responsive plant microRNAs	22,796
GRS10249	GIRS—(UQ) Functional pathogen genomics and characterisation of the infection mechanisms of the wheat and barley crown rot pathogen <i>Fusarium pseudograminearum</i>	7,917
GRS10258	GIRS—(US) Characterising potential symbiosome membrane proteins essential to the legume-rhizobium symbiosis	17,372
GRS10259	GIRS—(UA) (1,3;1,4) D-glucan biosynthesis in the Poaceae: Exploring transcriptional regulation, associated expression and specific activities of biosynthetic enzymes	20,847
GRS10268	GIRS—(UMU) Wheat potassium nutrition in saline and/or sodic soils and in drought-prone environments	6,786
GRS10275	GIRS—(UWA) The use of potassium to improve growth, water use and yield of canola under varying soil water conditions	20,838
GRS10290	GIRS—(RMIT) Forms, analysis and stability of vitamin E and selenium in grains and grain products	18,531
GRS10329	GIRS—(ANU) Investigating the role of root architecture regulators as mediators of environmental information in root development	27,796
GRS10335	GIRS—(UA) Foliar fertilisation of wheat plants—Phosphorus in combination with other nutrients	19,688
GRS10404	GIRS—(UWA) Detection and epidemiology of spring aphids in canola	28,489
GRS10405	GIRS—(UQ) Manipulating seed storage proteins to enhance sorghum digestibility	28,489
GRS10407	GIRS—(UA) Characterisation of novel forms of beta-glucanase in malting barley	28,489
GRS10408	GIRS—(UMU) Spatial and temporal distribution of severe weather events and their impact on grain crops	28,489
GRS10421	GIRS—(UQ) Development of functional molecular markers for key agronomic traits in the cultivated peanut, using next-generation sequencing technologies	28,489
GRS10432	GIRS—(ANU) Communicating controversial science to farmers	28,489
GRS10440	GIRS—(USCQ) Investigation of metabolic regulatory genes and hormones in pest snails	24,335
GRS10460	GIRS—(UWA) Characterisation of <i>Arabidopsis</i> nitrilases and 14-3-3 interactions in the processes of photosynthetic loss, leaf senescence and plant stress	27,363
GRS10471	GIRS—(USA) Whole-of-plant study of salinity tolerance: A mathematical modelling approach	30,863
GRS10474	GIRS—(UA) Nanotechnology and chemical-free approach for the protection of stored grain	28,489



Theme 6—Building skills and capacity		Expenditure \$
GRS10477	GIRS—(USQ) On-the-go proximal soil exchangeable ion sensing for precision management of sodicity	10,000
GRS10483	GIRS—(UCS) Determination of genetic markers for herbicide resistance in annual ryegrass using diversity array technology	28,489
GRS10486	GIRS—(ANU) Assessing the biology impact of wheat-infecting <i>Botryosphaeria</i> spp.	28,489
GRS10490	GIRS—(UA) Identification of arabinoxylan biosynthetic genes in plants	28,489
GRS10501	GIRS—(UQ) Identification of quantitative trait loci associated with heat tolerance in wheat for increased fertility and grain development/genetic variability in heat responses for grain development	20,180
GRS10505	GIRS—(ANU) Investigating the role of gamma-aminobutyric acid in pathogenicity in fungal wheat diseases	28,489
GRS10507	GIRS—(UQ) Identification of blackleg resistance genes in canola	28,489
GRS10512	GIRS—(USA) Mathematical and computational modelling for the phenotypic analysis of cereal plants	17,805
GRS10532	GIRS—(UQ) Identifying sources of resistance to necrotrophic plant pathogens using the model grass <i>Brachypodium distachyon</i>	29,677
GRS10564	GIRS—(CUR) Effector gene prediction from fungal pathogen genome assemblies	30,863
GRS10566	GIRS—(UWA) Understanding the strategies of outstanding performers in dryland farming enterprises	28,489
GRS10658	GIRS—(UQ) Regulation of the production of the mycotoxin deoxynivalenol by <i>Fusarium graminearum</i> and its according virulence on wheat and barley	29,044
GRS10660	GIRS—(US) Genotypic variation in mesophyll conductance of wheat ( <i>Triticum aestivum</i> ) and its effect on water use efficiency	29,044
GRS10661	GIRS—(UQ) Brewer nutrient recovery from wastewater using electro dialysis	29,044
GRS10664	GIRS—(UCS) Canola quality—The influence of processing parameters on valuable minor components	29,044
GRS10666	GIRS—(UWA) Are we going against the grain in training? Developing an adult education framework for the farming community	29,044
GRS10667	GIRS—(UQ) Identification of candidate genes for blackleg resistance in <i>Brassica juncea</i>	29,044
GRS10683	GIRS—(ANU) What are the epigenetic mechanisms involved in regulating stress response in <i>Arabidopsis thaliana</i> and <i>Brachypodium distachyon</i>	29,044
GRS10686	GIRS—(UA) Biological farming systems: Is there a role for mycorrhizas and organic amendments in the grain industry?	29,044
GRS10687	GIRS—(ANU) Ribonucleic acid secondary structure and the regulation of metabolism	29,044
GRS10690	GIRS—(UA) Manipulating and understanding barley phenology to maximise yield potential	29,044
GRS10691	GIRS—(UQ) Investigations into the biology and management of <i>Neocosmospora</i> root rot of peanuts in Australia	29,044
GRS10692	GIRS—(UWA) The influence of cereal monoculture and high crop residue levels on mineral nitrogen availability under long-term no-tillage systems	29,044
GRS10694	GIRS—(UWA) Investigating the molecular basis of thermal acclimation in plant mitochondria	29,044
GRS10695	GIRS—(UQ) Novel sources of disease resistance in brassica	29,044
GRS10698	GIRS—(UW) Studies in novel grains for the Australian food supply	29,044
GRS10699	GIRS—(UF) Alternative respiratory genes can improve tolerance to abiotic stresses in cereals	29,044
GRS10780	GIRS—(ANU) Components of immunity to <i>Stagonospora nodorum</i> in wheat	29,044
GRS10781	GIRS—(UA) Cereal transport proteins involved in boron toxicity tolerance: How natural variation and sequence diversification relate to structural and functional properties	29,044
GRS10783	GIRS—(UNC) The molecular characterisation of vernalisation in safflower via the development of genomic and transcriptomic resources	22,044



Theme 6—Building skills and capacity		Expenditure \$
GRS10796	GIRS—(UMU) Exploring sugar metabolism in bread wheat for improving drought tolerance	29,044
GRS10926	GIRS—(QUT) Automated weed and plant recognition for agricultural applications	14,693
GRS10927	GIRS—(US) Conjoint use of soil near-infrared and X-ray fluorescence spectroscopy in the field	14,693
GRS10929	GIRS—(RMIT) Modification of photosynthesis by gene replacement in crop plants.	9,795
GRS10930	GIRS—(USQ) Mechanisms of action of different wheat resistance quantitative trait locus to the root-lesion nematodes <i>Pratylenchus thornei</i> and <i>Pratylenchus neglectus</i> in lines from Australia and the CIMMYT program in Turkey	9,795
GRS10931	GIRS—(UA) Evaluating the abiotic stress tolerance of transgenic wheat and barley	9,795
GRS10932	GIRS—(USQ) A comparison of the growth patterns of three root pathogens in wheat	14,693
GRS10933	GIRS—(UF) Structural and functional analysis of wheat stem rust resistance proteins	14,693
GRS10934	GIRS—(ANU) Stabilising flowering time of wheat in response to autumn rainfall decline in the southern cropping region of Australia	14,693
GRS10935	GIRS—(UWA) Genomic research to improve the value of the narrow-leafed lupin ( <i>Lupinus angustifolius</i> ) grain	14,693
GRS10936	GIRS—(UF) Epigenetic control of grain stress tolerance via short interfering ribonucleic acid	7,347
GRS10938	GIRS—(UA) Molecular and genetic characterisation of early aleurone development in barley and wheat	12,244
GRS10939	GIRS—(UMU) Symbiotic effectiveness and genetic stability of <i>Mesorhizobium</i> root nodule bacteria	12,245
GRS10940	GIRS—(UQ) Investigating the relationship between stress tolerance genes and grain quality in barley ( <i>Hordeum vulgare</i> )	14,693
GRS10941	GIRS—(UQ) Identification of nitrate transporters and corresponding regulatory and metabolic genes under variable conditions of nitrate supply in diverse <i>Sorghum bicolor</i> genotypes for improved nitrogen use	7,347
GTA10909	TA—(UQ) International Plant and Animal Genome XXIII	3,500
GTA10910	TA—(ANU) 28th Fungal Genetics Conference	3,238
GTA10916	TA—(ACPFPG) Mini-symposium on Cereal Genomics	2,000
GTA10917	TA—Western Australian No-Tillage Farmers Association Australian Agronomy Conference	1,800
GTA10918	TA—(UQ) International Plant and Animal Genome XXIII	3,500
GTA10920	TA—(CSIRO) 14th International Cereal Rust and Powdery Mildew Conference	2,200
GTA10921	TA—(UQ) Plant Genomics Congress	2,500
HPC00001	Developing a GRDC grains industry leadership strategy and investment plan	19,515
ICN00015	National agribusiness reference group	60,638
IDA10858	IDA—(Mingenew Irwin Group) Next Generation tour of eastern states broadacre cropping grower research	5,000
IDA10887	IDA—Stirling Coast Farmers (SCF) Management of Herbicide Resistance: Investigation and study tour	14,800
IDA10888	IDA—(Ag Ex) Annual Grower Group Forum	13,600
IDA10889	IDA—South Australian No-till Farmers Association United States Study Tour	15,000
IDA10890	IDA—(Partners In Grain) Western Australia Farming Tour—Sharing Knowledge'	15,000
IDA10892	IDA—(Mallee Sustainable Farming) GRDC Update for Advisers	3,500
IDA10942	IDA—Agrilink Grassroots Agronomy (AAG) Grass-Roots Agronomy for Women in Farm Business	10,146
IPR00003	Vavilov–Frankel Fellowship	34,164
JKC00001	Grains industry tertiary education strategy	19,764
KDI00028	Australian Farmer of the Year Award 2014—Agricultural Student of the Year Award	5,000
KG200002	Situational analysis of grains industry quality assurance	30,000



Theme 6—Building skills and capacity		Expenditure \$
LYH00001	Building Skills and Capacity Theme—Strategy and monitoring, evaluation, reporting and improvement plan	10,000
NUF00010	Nuffield Australia Farming Scholarships	204,000
NYS00002	National Youth Science Forum	50,000
ORM00008	A Guide to Farm Labour: How to find and retain on-farm staff	541
OXI00001	Lentils: The Ute Guide application and website	5,880
PR325-1	Capacity maintenance—Managing grower and adviser human capacity for long-term sustainability of the grains industry	14,425
PRE00002	Regional Cropping Solutions Network—Measuring the impacts of different timings of summer weed control in the Kwinana East port zone	8,881
PYA00001	Art4Agriculture Program Grains Industry Partnership	5,000
PYA00002	Art4Agriculture Program Grains Industry Partnership	84,000
RDC00008	Contribution to the Collaborative Venture for Farming and Fishing Health and Safety Initiative	60,000
RDC00010	Horizon Scholarship sponsorship	10,000
RDC00011	Horizon Scholarship sponsorship	60,000
RDC00012	2014 Rural Women's Award Celebratory Dinner—National dinner partner sponsorship	10,000
RDP00014	GRDC resilient grain leaders	102,722
SUH00001	Building Skills and Capacity Theme—Gap analysis for issues	3,600
TAY00003	GRDC grains industry careers awareness and attraction strategy	20,000
TEK00001	Regional Cropping Solutions Network—Determining economic rates and incorporation for lime in the eastern wheatbelt of Western Australia	4,545
TIA00001	Increasing pulse plant pathology capacity via a project to clarify the interaction of waterlogging and ascochyta in lentils	6,985
UA00146	Theme PhD Scholarship—(JA) Diamondback moth dispersal and colonisation of Australian canola crops	29,044
UCS00022	Theme PhD Scholarship—(UCS) Understanding the mechanisms of weed suppression—Soil microbial diversity and biomass in the rhizosphere of weed suppressive wheat genotypes and cultivars	25,235
UCS00023	Theme PhD Scholarship—(UCS) Mechanisms of weed suppression by early vigour and other novel wheat genotypes	29,000
UHS10897	UHS—(UW) Statistical tools for next-generation plant breeding	10,000
UHS10898	UHS—(ANU) Dissecting the role of secondary metabolism in <i>Septoria nodorum</i> blotch	10,000
UHS10899	UHS—(UCS) The erosion and soil stability risk of incorporating stubble with fertiliser to increase soil organic carbon	10,000
UHS10901	UHS—(ANU) Identification and characterisation of hormone signalling receptors and key signalling cascades	10,000
UHS10902	UHS—(UCS) The effect of climate variability on emerging pathogens in cereal rotations	10,000
UHS10905	UHS—(UW) Accurate phenotyping for late maturity alpha-amylase classification traits	10,000
UHS10906	UHS—(UWA) Genotypic variation in wheat ( <i>Triticum aestivum</i> ) root phenologies and coleoptile lengths	10,000
UHS10908	UHS—(UA) Screening durum germplasm for antioxidant capacity	10,000
UHS10911	UHS—(UQ) Novel developmental impact of CLAVATA/ESR-related (CLE) peptides in legumes.	10,000
UHS10919	UHS—(UWA) Increasing brome grass seed retention through agronomic and chemical manipulation	10,000
UHS10922	UHS—(ANU) Investigating C-terminally encoded peptide control of plant growth and development in response to nitrogen availability	10,000
UHS10923	UHS—(UM) Key disease determinants of the blackleg fungal pathogen of canola	10,000



Theme 6—Building skills and capacity		Expenditure \$
UHS10924	UHS—(UQ) Structure/function studies of wheat stem rust effectors	10,000
UHS10943	UHS—(UA) Ribonucleic acid methylation in relation to stress tolerance in <i>Brassica rapa</i>	10,000
UHS159	UHS—(US) Influence of seeding systems disturbance on pre-emergent herbicide damage on wheat in northern New South Wales	7,500
UM00054	Theme PhD Scholarship—(JM) Predicting insect pest issues in Australian grain crops	25,235
UNE00019	Graduate certificate and diploma in sustainable grains production for industry advisers and growers	353,212
US00069	Enhancing human capacity for soil knowledge transfer and decision making for a sustainable grains industry	198,765
USA00017	Building capacity in stored grain facilities research	125,000
UW00004	Capacity building for statistics	150,000
UW00007	Statistical input to wheat quality trials	64,884
UWA00144	Building national capacity in education and research in applied entomology	162,440
VGA00001	Publishing current and historic grower group trials on GRDC web platform	174,000
<b>THEME 6—BUILDING SKILLS AND CAPACITY TOTAL</b>		<b>9,933,032</b>

Foundational activities		Expenditure \$
AAA00008	Agricultural Biotechnology Council of Australia	100,000
AAC00007	Australian Grains Industry Conference 2015–17 GRDC Grower Day	10,000
AAM00003	Increasing profitability through the utilisation of combined technologies to target input strategies to productive capacity of soils	50,000
ABP00003	Provision of grains industry value chain contact details to the GRDC suitable for integration into the GRDC's customer relationship management database	42,800
ACO00003	Regional science writer services—Southern Region	193,860
ACO00007	Develop the GRDC Western Region corporate display	5,500
ACO00014	Professional support services for the planning and running of the GRDC's Grower Research and Development Forum	5,000
AKI00001	Agribusiness Trial Extension Networks: Poor nodulation of beans in Kangaroo Island	18,750
ANV00013	Ground Cover TV	342,576
ANV00015	Spray application video segments	51,046
ANV00016	Video services to record, edit and publish presentations from the 2015 GRDC Crop Updates in the Northern, Southern and Western regions for use on its YouTube channel and KnowledgeVision	136,635
ANV00017	Video services to record, edit and publish two videos demonstrating and explaining key factors in successful incorporation of pre-emergent herbicides for the most effective weed control and to minimise crop damage	12,420
ARN00003	Provision of content and images for revised version of GRDC Weed Ute Guide App	47,275
ARP00002	Agribusiness Trial Extension Networks: Assess the yield response of cereals to gypsum applications in the Wimmera	18,483
ATR00028	Update of previous impact assessment and an ex-ante analysis of further investment in managing climate variability	28,800
AVE00001	Economic feasibility analysis for polymer use on non-wetting soils	14,400
BAE00024	Australian Agricultural and Grazing Industries Survey: 2013–14 and 2014–15	554,358
BGC00003	Spray application manual for grain production	156,040
CAN00004	Warehouse and distribution of GRDC's publications, periodicals and promotional material	32,827
CAS00004	Common seed 'bulk-up' to provide seed for all relevant GRDC research investments	225,066



	Foundational activities	Expenditure \$
CAS00005	Field trial auditing and reporting for GRDC investments	244,713
CAS00007	Assessment of late maturity amylase field risk	183,000
CCS72-1	Corporate communication activity	100
CIC00021	Regional communicator services— Northern Region	203,085
CIC00022	Regional communicator services— Western Region	198,616
CIC00023	Regional science writer services— Western Region	187,045
CIC00028	Northern Region field day support	60,000
CLO00001	Agribusiness Trial Extension Networks: Identify options for the control of glyphosate-resistant ryegrass	16,890
CNG00002	GRDC website performance monitoring	31,002
COR00035	Converting of information from research reports for a grower audience	150,000
COR00036	Ground Cover Direct publications catalogues	58,960
COR00037	Provision of editorial, production, printing and distribution of GRDC's Ground Cover Newspaper and Ground Cover Supplements	1,498,839
COR00040	Paddock Diary mailout	5,527
COR00041	Queensland Wheat Variety Guides	14,232
COR00042	South Australian Sowing Guides	8,908
COR00043	Western Australian Wheat Variety Guides	9,239
COR00044	Western Australian Barley Variety Guides	19,339
COR00045	Victorian Sowing Guides	9,639
COR00046	Ongoing updating and maintenance of the GRDC image library	37,120
COR00047	Supply of professional images for the GRDC image library	56,550
CUC00001	eXtensionAUS— Project coordination	298,944
DAN00137	Managed environment facility: Yanco	941,874
DAS00156	South Australia Crop Variety Sowing Guides	31,629
DAV00139	Managed environment facility: Hamilton	95,000
DAW00198	Managed environment facility: Merredin	907,762
DAW00251	Investigate and extend effective and reasonably priced monitoring and control methods for snails and slugs in the Albany and Esperance port zone	37,500
DAW00254	Furrow formation and inter-row compaction for improved wheat production in water-limited environments of the wheatbelt of Western Australia	36,000
DER00017	GRDC research partner survey	10,700
DGB00001	Investment Review	16,600
DIV00001	Western Region Machinery Field Days	27,772
ECG00001	Stakeholder and community relations— Engagement strategy development and service delivery	50,000
ECO00009	Regional science writer services— Northern Region	137,044
EDE00001	Communication services	70,000
ENG00001	Transitioning family farming businesses	30,000
EXF00001	eXtensionAUS— Trial	11,982
FA14-1	GRDC website redevelopment— Phase III	26,640
FA14-2	Social media initiative	11,950
FA23-1	Journal subscriptions required for the GRDC knowledge library and agronomy notes	2,616
FA32-1	GRDC GrowNotes— Invoices	12,664



Foundational activities		Expenditure \$
FA43-1	Baker's Dozen	90
FPL00004	Renewal of the GRDC website Funnelback licence	4,918
GIA00002	Delivery of GRDC/DAFWA Western Australian agribusiness and regional crop updates	131,600
GPA00004	Consultation and project activities	80,000
GRA00004	Agribusiness Trial Extension Networks: Herbicide resistance in no-till systems in southern New South Wales	18,750
GS18-1	Publications budget	2,383
GS20-1	GRDC publications support	1,128
GS20-1A	GRDC publications support—Expenses	7,986
HFG00007	Agribusiness Trial Extension Networks: Alternative insect management strategies to maintain and increase beneficial species, avoid insecticide resistance and reduce personal exposure to insecticides	18,750
HIL00001	Regional Cropping Solutions Network—Facilitator	316,480
ICN00014	GRDC research updates—Northern Region	300,000
JLC00013	Final report editing for GRDC website for advisers and growers	161,450
KDI00026	Understanding map layers for variable rate technology	17,858
KG00002	Investment Review	13,300
KQU00003	Know question external collaboration and workflow system	108,000
LDP00003	Optical character recognition scanning of GRDC ute guides—App development	9,420
MAA00007	Informing growers of GRDC investments through <i>The COB</i> magazine	9,000
MLP00003	Facilitation of Western Panel Pulse Workshop March 2015	15,000
NZX00002	Provision of marketing content for GrowNotes	75,000
OBR00003	Driving Agronomy radio program	80,000
OBR00004	Ground Cover radio and regional weekly update audio programs	113,850
ORM00005	GRDC research updates—Southern Region	600,000
ORM00012	GRDC farm business updates—Western Region	140,000
ORM00014	GRDC research updates—Southern Region	136,383
ORM00015	GRDC farm business updates—Southern Region	98,868
ORM00016	Planning, sourcing and producing content for a GrowNote publication on farm business models	92,500
PIG00009	Managing the grain growing business	290,816
PLN00011	Regional Cropping Solutions Network	16,400
PNS00012	Issues-based campaigns: In the field with John Harvey	37,986
PNS00016	Regional communicator services—Southern Region	299,481
PNS00018	Communication strategy	7,500
PNS00019	Case study development	45,000
PR305-1	Regional Cropping Solutions Network—Expenses	27,374
PR333-1	Regional Cropping Solutions Network—Advertising	78,902
PR333-4	Regional Cropping Solutions Network—Meeting expenses	77,642
PR333-5A	GRDC grower development program	35,021
PRE00004	Regional Cropping Solutions Network—Fast track projects	20,000
PTP00002	Development of instructional video and online materials to improve grower and adviser awareness of <i>Farming the Business</i>	6,500
RAI00005	Regional Cropping Solutions Network—Fast track projects	20,000



Foundational activities		Expenditure \$
RDC00013	RIRDC Rural Woman of the Year Award 2015	20,000
RHC00006	Corporate brand strategy	5,000
RHC00007	2015 GRDC products and services market research	183,822
RHC00008	Branding strategy implementation	40,000
RHC00009	Content audit—Discovery, triage and clearance services for the refinement and improved accessibility of content on the GRDC website	505,329
RRA00038	GRDC website bookshop payment gateway	3,900
RRA00053	GRDC website Redmine backlog bug fixing	23,040
RRA00055	GRDC website Sitecore upgrades	24,000
RWB00002	Rural Focus interviews with the Western Panel	8,100
SAM00001	Regional Cropping Solutions Network—Fast track project—Evaluating the use of precision agriculture technology to increase the efficacy of slug baiting systems in no-till cropping systems	24,200
SBM00001	GRDC northern agronomy notes	183,984
SBM00002	Ute Guide apps and mobile resources	200,000
SBM00003	GRDC GrowNotes tips and tactics for publication and website	150,000
SBM00004	GRDC GrowNotes pilot—North	98,971
SBM00005	GRDC GrowNotes pilot—South	99,910
SBM00006	GRDC GrowNotes pilot—West	98,083
SBM00007	GRDC GrowNotes wheat update—Western Region	38,225
SBM00008	GRDC GrowNote—Herbicide use—Pilot	90,000
SCF00003	Rotation renewal: Profitable legume phase options	19,160
SFS00030	Agribusiness Trial Extension Networks: Impact canola establishment within the high-rainfall zone	26,100
SIT00001	Redevelopment of the website (www.grdc.com.au) and content management system development	11,900
SKC00003	Delivery of machinery field days in the Western Region	5,634
SKC00004	GRDC Western Region machinery field days display creation and management	30,000
SSS00002	GRDC GrowNotes wheat—Western Region	131,813
TAR00003	Regional Cropping Solutions Network—Fast track projects	25,620
TAR00004	Regional Cropping Solutions Network—Fast track projects	51,150
UB00003	Online farm trials research—Developing new technologies to improve access to and adoption of research findings	750,000
UB00004	Online final reports research—Innovative knowledge management approaches to support greater research uptake	216,050
US00051	National managed environment facility: Narrabri	1,345,481
UW00005	Statistics for the Australian Grains Industry	1,238,116
VR174	National Variety Trials Program	9,113,200
WDM00010	Ground Cover Paddock Diary	27,890
WMG00002	Development of self-testing, diagnostic protocols for compaction	29,550
WZ00001	GRDC website Weatherzone	4,944
ZIA00001	Developing a membership identification process and database for GRDC levy payers	33,528
<b>FOUNDATIONAL ACTIVITIES TOTAL</b>		<b>26,167,351</b>



R&D management		Expenditure \$
ABO00001	Laboratory testing services agreement	6,100
AEG00008	Wheat stock information	80,000
AGP2	Independent Director—Australian Grain Technologies	61,139
AMC00019	Progress report evaluation	2,000
ATR00023	2014 Ex post aggregate analysis	27,600
ATR00024	Risk return analysis for 144 project investments	18,000
ATR00025	Impact assessment of Australian Peanut Genetic Improvement Program	15,950
ATR00026	Economic analysis of the prospective heat initiative	23,000
ATR00027	Ex-post impact assessment of Mungbean Breeding Program	17,600
ATR00029	Ex-ante analysis of investment in the water productivity initiative	21,600
BAZ00002	Investment Review	28,838
BAZ00003	Investment Review	10,451
BBE00017	Independent Director and Chairman—Novozymes Biologicals Australia	18,468
BBE00027	Independent Director—Novozymes Biologicals Australia Pty Ltd	18,023
BWA00002	Investment Review	25,900
CON00001	Investment Review	7,500
CRY00001	Management Services Agreement	3,029
CSP00195	Soil constraints initiative—Management of non-wetting sands	123,767
DAQ00201	National pest information service	350,000
DER00016	GRDC grower surveys	30,125
DER00022	GRDC grower surveys	83,110
DLP00001	Independent Director and Chair—Wheat Quality Australia	50,434
DSP00002	Integeo mapping application	25,870
FA04-1	Council of Rural Research and Development Corporations membership, contribution and project allowance	120,922
FA12-05	Investment Review—Expenses	676
FA20-1	Grains Industry National Rural Development and Extension Strategy	45,209
FA26-1	Progress report evaluations	6,000
GHC00003	Intellectual property analysis	10,000
GHC00004	Intellectual property analysis	10,500
GRE00001	Investment Review	44,928
HCP00002	Progress report evaluation	4,545
IIG00001	Investment Review	38,400
JKH00002	Progress report evaluation	4,200
JOL00010	Progress report evaluation	8,909
JOL00011	Investment Review	12,000
JSS00001	Investment Review	20,544
KQU00002	GRDC knowledge library prototype	15,000
KSU00001	Global market analysis for wheat, barley, canola and sorghum	108,507
LCA00001	Investment Review	4,580
LCM00001	Global agriculture and the role of Australia—Guiding the allocation of GRDC's Research Budget	28,415
MCC00016	Progress report evaluation	4,400



R&D management		Expenditure \$
MCD00001	Investment Review	24,787
MDE00003	Customer relationship management consultancy and campaign development	356,382
MER00001-1	Theme engagement in monitoring, evaluation, reporting and improvement	518,973
MIW00001	Independent Director—Australian Grain Technologies	24,000
MLP00002	Investment Review	20,379
MMO00006	Media monitoring and analysis services	224,400
NBC00001	Independent Director—Wheat Quality Australia	30,012
NOB00001	Investment Review	31,201
NP99-1	Conceptual scoping and market intelligence	7,480
PNS00017	Value case studies	10,000
PRC00002	Investment Review	28,000
RAA00001	Cross industry automation workshop and report recommendations	37,888
RBI00001	Independent Director—Australian Grain Technologies	60,369
RDEM1-1	Commercialisation and plant breeder's rights activities	9,277
RDEM3-1	Commercialisation and expression of interest activities	24,042
RDEM6-2	Research funding applications—Evaluation process	135,358
RDEM8-1	Commercialisation activities	37,738
RDEM9-1	Intellectual property management	127,874
SMC00001	Independent Director—Grains and Legumes Nutrition Council Ltd	15,488
SPI00001	Investment review	13,800
SPI00002	Facilitate the intellectual property management and commercialisation discussions for the future farm workshops	2,300
SPI00003	Investment Review	2,990
TAP00004	Independent Director—Australian Crop Accreditation System	32,490
UNE00023	Coordination of nitrogen fixation program	15,000
VL00001	Independent Director—Arista Cereal Technologies Ltd	44,303
<b>R&amp;D MANAGEMENT TOTAL</b>		<b>3,370,768</b>
<b>TOTAL</b>		<b>194,106,788</b>

ACPGF = Australian Centre for Plant Functional Genomics, ANU = Australian National University, ATA = Agricultural Training Award, CIMMYT = International Maize and Wheat Improvement Center, CRC = cooperative research centre, CS = Conference Sponsorship, CSIRO = Commonwealth Scientific and Industrial Research Organisation, CUR = Curtin University of Technology, Western Australia, DAFWA = Department of Agriculture and Food, Western Australia, GIRS = Grains Industry Research Scholarship, ICARDA = International Center for Agricultural Research in the Dry Areas, IDA = Industry Development Award, NSW = New South Wales, QUT = Queensland University of Technology, RIFDC = Rural Industries Research and Development Corporation, RMIT = RMIT University, SA = South Australia, SARDI = South Australian Research and Development Institute, TA = Travel Award, UA = University of Adelaide, UCS = Charles Sturt University, UF = Flinders University, UHS = Undergraduate Honours Scholarship, UM = University of Melbourne, UMU = Murdoch University, UNC = University of Newcastle, UQ = University of Queensland, US = University of Sydney, USA = University of South Australia, USCQ = University of Sunshine Coast, USQ = University of Southern Queensland, UW = University of Wollongong, UWA = University of Western Australia, WA = Western Australia



# Appendix C—Joint R&D projects

## Joint R&D projects and partners

GRDC partners	Project ID	Project	Start	Finish
ACO, SAGIT	ACO00009	2014 Seed to Store Careers Advisers event	1 Jul 2014	30 Jun 2015
ACO, SAGIT	ACO00010	2014 Seed to Store YouTube Clip competition	1 Jul 2014	30 Jun 2015
ARC, DAV, SARDI, UA, UM, UQ	ACP00002-Q	Australian Centre for Plant Functional Genomics Phase II	1 Jan 2008	30 Jun 2017
AEGIC, DAW	AEG00002	Australian Export Grains Innovation Centre	1 Jul 2012	30 Jun 2015
AEGIC, DAW, ECU	AEG00003	Research capacity in barley malting and brewing	1 Jul 2013	30 Jun 2016
AEGIC, DAW	AEG00005	Objective market intelligence on the Indonesian and South-East Asian wheat markets	1 Jul 2014	30 Jun 2016
AEGIC, UCS, DAQ, DAV, DAW, USA	AEG00006	Foundation: Market Intelligence for Meeting Market Requirements Theme	15 Apr 2015	30 Jun 2016
BA, Barrett Burston Malting Co, Cargill Malt Co, Carlton and United Breweries, DAQ	BA00007	Pilot brewing for malting barley lines	30 Jun 2012	30 Jun 2015
ABARES, DA, MLA	BAE00024	Australian Agricultural and Grazing Industries Survey: 2013–14 and 2014–15	1 Jul 2013	30 Jun 2015
Bates Ag, BCG, BPC, Cropfacts, DAN, ICC, IP, SARDI, Sparke Agricultural & Associates	BWD00021	More Profit from Crop Nutrition II—Extension and training Southern Region	1 Jul 2012	30 Jun 2017
BCG, ICC, SFS, VNTFA	BWD00024	Maintaining profitable farming systems with retained stubble—Victoria and Tasmania	1 Jul 2013	30 Jun 2018
BCG, CSIRO	BWD00025	National paddock survey initiative	1 May 2014	15 Mar 2019
CAS, InterGrain, WQA	CAS00007	Assessment of late maturity amylase field risk	30 May 2015	30 Jun 2018
CES, CSIRO	CES00003	Aphid and insecticide resistance management in oilseed and pulse crops	30 Jun 2015	30 Jun 2019
CSIRO, DAW	CFF00008	Assessment of leaf area index, tiller survival and short delay in flowering as candidate traits for tolerance to early drought in wheat	2 Mar 2015	2 Mar 2016
CSIRO, UW	CSA00027	Adding value to GRDC's National Variety Trials network	29 Mar 2010	30 Jun 2015
CSIRO, UWA	CSA00029	National integration of crop sequence strategies and tactics	1 Jul 2010	30 Jun 2016
AEGIC, CSIRO, DAQ, DAW	CSA00036	More Profit from Crop Nutrition II—Analysis frameworks to support profitable fertiliser use	1 Sep 2012	31 Aug 2015
AgEconPlus, AMC, CSIRO, UQ, UWA	CSA00043	Impact of weeds on Australian grain production and adoption of no-till cropping practices	1 Jul 2013	31 Dec 2015
CSIRO, DAQ, UQ	CSA00050	Northern farming systems—Integrating research solutions for profitable outcomes	30 Jun 2014	30 Jun 2019
CSIRO, DAW, Mudge Consulting, SARDI	CSA00053	Impacts of climate on low rainfall and marginal areas	9 Mar 2015	9 Sep 2015
CSIRO, DAQ	CSE00055	Crop sequences to manage soil pathogens and reduce the yield gap of northern grain production	1 Jun 2011	30 Jun 2016
ANU, CSIRO	CSE00056	Bioroutes to urea fertilisers	1 Jul 2010	30 Jun 2015
CES, CSIRO, DAN, DAW, SARDI, UM	CSE00059	New knowledge to improve the timing of pest management decisions in grain crops	3 Jan 2015	30 Jun 2020



GRDC partners	Project ID	Project	Start	Finish
CSIRO, UWA	CSO00044	Understanding biological farming inputs	30 Jun 2014	20 Jun 2017
CSIRO, DAW	CSP00143	New strategies for phenotyping reproductive stage frost and chilling tolerance in wheat	1 Dec 2010	30 Jun 2016
AEGIC, CSIRO, DAW	CSP00144	Genetic analysis of wheat quality using MAGIC (multiparent advanced generation intercross) populations	1 Jul 2010	30 Mar 2016
BCG, CSIRO, CWFS, DAN, DAV, FLR, ICC, MFM, RPI, SFS	CSP00146	Facilitating increased on-farm adoption of broadleaf species in crop sequences to improve grain production and profitability	1 Jul 2010	31 Mar 2016
CSIRO, DAN	CSP00157	Australian Soybean Breeding Program	30 Jun 2012	30 Jun 2017
CSIRO, DAW	CSP00160	Refining variety and management recommendations to improve productivity and resource use efficiency of dual-purpose crops in Australia	3 Jun 2012	31 Dec 2015
CSIRO, CIMMYT, US	CSP00164	Australian Cereal Rust Control Program—Molecular marker program CSIRO–University of Sydney–CIMMYT collaborative project	1 Jul 2012	30 Jun 2017
CSIRO, UQ	CSP00179	Raising water productivity: Trait assessment for Australian rainfed wheat	1 Jul 2013	30 Jun 2018
CSIRO, DAQ	CSP00180	Maintaining yield stability of wheat under spring frosts	1 Jul 2013	30 Jun 2017
CSIRO, UM	CSP00181	Molecular control of wild radish using SP11 protein	1 Jul 2013	30 Jun 2015
CSIRO, UA, DAV	CSP00183	Pedigree-based association genetic analysis of wheat phenology	1 Jan 2014	1 Jul 2018
CSIRO, DAN, SARDI	CSP00187	Optimised canola profitability—Understanding the relationship between physiology and tactical agronomy management	30 Jun 2014	30 Jun 2019
CUR, FAR, Kalyx	CUR00019	Fungicide evaluation of new-generation actives in cereals and pulse crops	30 Jun 2012	1 Jul 2014
CUR, DAV, ICARDA, PBA	CUR00020	Managing on-farm biosecurity risk through pre-emptive breeding: The case of rust in field pea and lentil	1 Jun 2013	30 Jun 2018
CUR, UWA	CUR00022	Fungicide resistance management strategy and communications	30 Nov 2013	30 Nov 2017
CUR, DAN, UT, UWA	CUR00024	Genetics of wild germplasm, gene-pool expansion and integrated assisted single seed descent approach to enhance adaptive potential in chickpea	30 Jun 2014	30 Jun 2019
BCG, CWFS, DAN, MSF, SARDI, UCS	CWF00020	Overdependence on agrochemicals	1 Jul 2014	30 Jun 2017
Agriculture, CRDC, DA, DAN, DAV, DSITI, IP, QUT, UM, UNE, UWA	DAF00004-10	Nitrous Oxide Research Program Phase 2—Managing an integrated, data synthesis and modelling research network for reducing nitrous oxide emissions from Australian soils	1 Jul 2012	30 Jun 2015
DAN, UCS, UQ	DAN00117	Development of molecular markers for application in Australian canola breeding	1 Jul 2008	30 Jun 2016
DAN, UCS, ICRISAT	DAN00139	Improving food quality and end use market acceptance of Australian pulses—Cooking and sensory	1 Jul 2010	31 Dec 2014
DAN, DAV, ICARDA	DAN00140	New tools and germplasm for Australian pulse-breeding programs to respond to changing virus threats	1 Jul 2010	30 June 2015
CSIRO, DAN, FLR, UCS	DAN00152	The strategic use of tillage within conservation farming	30 Jun 2011	30 Jun 2016



GRDC partners	Project ID	Project	Start	Finish
DAN, UA	DAN00162	Evaluation of durum material in managed environment facilities	1 Jul 2011	30 June 2015
DAN, UA	DAN00163	Durum Breeding Australia	30 Jun 2012	30 Jun 2017
DAN, BPC, KIP Consulting	DAN00165	More Profit from Crop Nutrition II—Program coordination and communication	25 Jun 2012	30 Jun 2017
BPC, Geographic Web Solutions, DAN, DAQ, DAW, KIP Consulting, SARDI, UCS, UMU	DAN00166	More Profit from Crop Nutrition II—Making better fertiliser decisions for cropping systems in Australia phase 2	25 Jun 2012	30 Jun 2017
Ag Grow Agronomy and Research, DAN, FLR, MFM, SFS, UCS	DAN00168	More Profit from Crop Nutrition II—Regional soil-testing guidelines for the Southern Region	1 Jul 2012	30 Jun 2017
DAN, US	DAN00169	Building resilient and profitable grain-cropping systems through improved knowledge of soil organic carbon fractions and their functionality	12 Apr 2013	30 Jun 2017
DAN, DAQ, UA	DAN00172	Managing crop disease—Improving chickpea pathogen resistance	1 Jun 2013	30 Jun 2018
BCG, DAN, SARDI	DAN00173	Management of barley and barley cultivars for the Southern Region	25 Jun 2013	30 Jun 2018
Biosecurity NSW, DAN, ICARDA	DAN00174	Managing on-farm biosecurity risk in wheat through pre-emptive breeding	30 Jun 2013	31 May 2018
DAN, DAQ, DAV, DAW, SARDI	DAN00175	National crown rot epidemiology and management program	30 Jun 2013	30 Jun 2018
DAN, DAQ, DAV, DAW, SANTFA, UA, US, USC, UWA	DAN00180	Does increased herbicide use impact on key soil biological processes?	1 Jul 2013	1 Jun 2018
CSIRO, DAN, Life Cycle Strategies	DAN00186	Identifying national opportunities for grains emissions mitigation and other environmental improvement, using life cycle assessment and the Australian Agricultural Life Cycle Inventory (AusAgLCI)	1 Jul 2014	30 Jun 2017
DAN, US	DAN00189	Australian Inoculants Research Group: National independent quality assurance and germplasm maintenance for <i>Rhizobium</i> inoculants	1 Jul 2013	30 Jun 2017
CSIRO, DAN, Holbrook Landcare Network	DAN00191	Nitrogen-fixing break crops and pastures for high-rainfall zone acid soils	1 Jul 2014	30 Jun 2018
DAN, DAQ	DAN00195	Tactical crop agronomy of sorghum and maize in the Northern Region—New South Wales component	1 Jul 2014	30 Jun 2017
DAN, DAQ, SARDI, UNE, USQ, UWS	DAN00196	Eliminating grain defects in chickpeas	30 Jun 2014	30 Jun 2017
DAN, DAQ, DAV, DAW, ICARDA, UQ	DAN00202	New tools and germplasm for Australian pulse and oilseeds breeding programs to respond to changing virus threats	1 Apr 2015	30 Jun 2020
CSIRO, DAN, UCS, ULA	DAN00206	Innovative approaches to managing subsoil acidity in the southern grain region	1 Jan 2015	30 Jun 2020
Biological Crop Protection, DAQ	DAQ00164	Biological suppression of root-lesion nematodes in grain-growing soils	1 Jul 2010	30 Jun 2015
DAQ, USQ	DAQ00171	Genetic options for nematode control	30 May 2011	30 Jun 2015
DAQ, SRA	DAQ00174	Cropping solutions for the sugarcane farming systems of the Burdekin	1 Jun 2011	31 May 2015
CES, DAQ, DAN, ICAN, SARDI	DAQ00179	Integrated pest management training	1 Jul 2012	30 Jun 2015



GRDC partners	Project ID	Project	Start	Finish
DAN, DAQ	DAQ00184	Grower solution project for Queensland coastal and inland Burnett and New South Wales north coast	1 Jul 2012	30 Jun 2015
DAQ, PCA, USQ	DAQ00186	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease	30 Jun 2013	30 Jun 2018
ANU, DAN, DAQ, DAV, DAW, SARDI, UA, USQ, UT	DAQ00187	National barley foliar pathogen variety improvement program	30 Jun 2013	30 Jun 2018
DAN, DAQ	DAQ00192	Northern farming systems—Integrating research solutions for profitable outcomes	30 Jun 2014	30 Jun 2019
BCG, DAN, DAQ, DAW, UCS	DAQ00197	Cultural management options for herbicide-resistant weeds	1 Jan 2015	31 Aug 2015
DAN, DAQ, DAV, DAW, DSITI, SARDI, UNS, UQ, UW	DAQ00200	Soil constraints initiative—Management of sodic and magnesic soils	1 Jan 2015	30 Jun 2020
CES, DAQ, DAW, SARDI	DAQ00201	National pest information service	1 Jul 2014	30 Jun 2018
SARDI, UA, UM	DAS00094	Diamondback moth control and insecticide resistance management	1 Mar 2009	30 Jun 2015
Biological Crop Protection, SARDI	DAS00111	DNA tests for nematode community analysis	1 Jun 2010	30 Jun 2015
SARDI, UA	DAS00113	Pulse Breeding Australia—PhD improving metribuzin tolerance in lentil	1 Jul 2010	30 Jun 2016
DAV, SARDI	DAS00116	Genetic options for nematode control in the Southern Region	1 Jul 2010	30 Jun 2015
BCG, CSIRO, CWFS, MSF, SARDI, UNFS	DAS00119	Profitable crop sequencing in the low-rainfall areas of south-eastern Australia	1 Jul 2010	31 Mar 2016
SARDI, UA	DAS00121	Pulse germplasm enhancement—Abiotic stresses	1 Jul 2011	30 Jun 2016
CSIRO, SARDI, USA	DAS00125	Fungicide control of <i>Rhizoctonia</i> —Part A	1 Jul 2011	30 Jun 2016
SARDI, UA	DAS00128	Optimising nitrogen fixation of grain legumes—Southern Region	1 Jul 2012	30 Jun 2017
RIRDC, DAW, SARDI	DAS00129	National Oat Breeding Program—Healthy and productive grain varieties for the future	1 Jul 2012	30 Jun 2017
SARDI, UA	DAS00131	Improving weed management in pulse crops through herbicide tolerance—Part B	30 Jun 2013	30 Jun 2018
SARDI, US	DAS00133	Improved resistance to oat pathogens and abiotic stress management	1 Jun 2013	30 Jun 2018
CSIRO, SARDI, UM	DAS00134	Improved management of snails and slugs	30 Jun 2013	30 Jun 2016
SARDI, USA	DAS00136	New fungicide technologies for crown rot management	30 Jun 2013	30 Jun 2016
DAN, DAQ, DAV, DAW, SARDI	DAS00137	National improved molecular diagnostics for disease management	30 Jun 2013	30 Jun 2018
DAN, SARDI, UQ	DAS00140	Improving yield and reliability of field peas and chickpeas under water deficit	30 Jun 2013	30 Jun 2017
DAN, DAQ, DAW, International Plant Nutrition Institute, IP, SARDI, UCS	DAS00146	More Profit from Crop Nutrition II—Managing micronutrient deficiencies in cropping systems of eastern Australia	1 Apr 2014	30 Jun 2017
AWI, DA, MLA, RIRDC, SARDI	DAS00148	Australian Pastures Genebank	1 Jul 2013	30 Jun 2018
RIRDC, SARDI	DAS00149	Vetch varieties for grain and hay production for Australian farmers	30 Jun 2014	30 Jun 2017



GRDC partners	Project ID	Project	Start	Finish
SARDI, UA	DAS00155	Diamondback moth control and insecticide resistance management	30 Nov 2014	3 Nov 2017
SARDI, UQ	DAS00157	More Profit From Crop Nutrition II—Nitrogen and water interactions	3 Jan 2015	31 Dec 2015
DAN, DAV, SARDI	DAV00113	Expanding the use of pulses in the Southern Region	1 Jul 2010	30 Jun 2016
DAV, SARDI	DAV00123	Victorian field crop nematology project	1 Jun 2012	30 Jun 2015
Agriculture, DAN, DAV	DAV00125	More Profit from Crop Nutrition II—Improving nitrous oxide abatement in higher rainfall cropping systems and developing nitrogen response curves	1 Jul 2012	30 Jun 2015
DAN, DAV, UA	DAV00126	Molecular markers for pulse-breeding programs	30 Jun 2013	30 Jun 2016
CSIRO, DAV	DAV00127	Using next-generation genetics to accelerate variety improvement in bread wheat, durum and barley	30 Jun 2013	30 Jun 2018
DAN, DAQ, DAV, DAW, SARDI	DAV00128	National nematode epidemiology and management program	30 Jun 2013	30 Jun 2018
AVRDC, CIMMYT, DAN, DAQ, DAV, ICARDA, ICRISAT, USDA	DAV00131	Australian Grains Genebank—Phase 2	30 Jun 2013	30 Jun 2017
DAV, UM	DAV00137	Maintaining productivity and quality of wheat under elevated carbon dioxide	1 Jul 2014	30 Jun 2017
DAN, DAQ, DAV, DAW, Grains Pathology, Landmark, Nufarm, SARDI	DAV00138	eXtensionAUS—Field crop diseases learning network	1 Jan 2014	29 Jun 2015
CUR, DAV, DAW, UA, USQ	DAW00206	Germplasm enhancement for yellow spot resistance in wheat	1 Jul 2010	30 Jun 2015
DAW, FG, LIE, MIG, WANTFA	DAW00213	Putting the focus on profitable break crop and pasture sequences in Western Australia	1 Jul 2010	30 Jun 2016
DAW, InterGrain	DAW00219	Characterising and exploiting genetic diversity in wheat and barley for tolerance to water deficit during germination and crop establishment	1 Jul 2011	30 Jun 2015
DAQ, DAW	DAW00220	Barley grain defects—Research and screening services	30 Jun 2012	30 Jun 2015
DAW, UMU	DAW00221	Optimising nitrogen fixation of grain legumes—Western Region	1 Jul 2012	30 Jun 2017
DAN, DAQ, DAV, DAW, MGP, SARDI, UWA	DAW00228	National pathogen management modelling and delivery of decision support	30 Jun 2013	30 Jun 2018
CUR, DAW	DAW00229	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease—Western Australia	30 Jun 2013	30 Jun 2018
Corrigin Farm Improvement Group, DAW, UA	DAW00234	Determining yield under frost—One degree at a time	1 Jan 2014	30 Jun 2018
CSBP, DAW, UMU	DAW00239	More Profit from Crop Nutrition II—Managing micronutrient deficiencies in cropping systems of Western Australia	1 Jun 2014	30 Jun 2017
AGT, DAW, InterGrain, UA, UMU, UT	DAW00240	Manipulating barley phenology to maximise yield potential	30 Jun 2014	30 Jun 2019
DAN, DAW, BCG, Living Farm, UA	DAW00241	Farming systems to improve crop tolerance to frost	1 Jul 2014	30 Jun 2016
CSIRO, DAW, LIE, PAA	DAW00242	Subsoil constraints—Understanding and management	1 Jul 2014	30 Jun 2019



GRDC partners	Project ID	Project	Start	Finish
CSIRO, DAW, UMU	DAW00244	Delivering enhanced agronomic strategies for improved crop performance on water-repellent soils in Western Australia	1 Jul 2014	30 Jun 2019
DAN, DAQ, DAV, DAW	DAW00245	Yield loss response curves for host resistance to leaf, crown and root diseases in wheat and barley	30 Jun 2014	30 Jun 2019
CUR, DAW, UA, USQ	DAW00247	Improved genetic solutions for management of yellow spot in wheat	1 Jun 2015	30 Jun 2020
DAW, RSS, UWA,	DAW00252	Innovative approaches to managing subsoil acidity in the Western Region	1 Apr 2015	30 Jun 2020
FAR, SFS	FAR00003	Hyperyielding cereals—A feed grain initiative	30 Jun 2015	30 Jun 2020
AEGIC, DAN, GGL	GGL00003	Evaluating the quality of competitor varieties in Australian wheat export markets	1 Jul 2014	30 Jun 2016
DAW, GPC	GPC00001	Extension of nitrogen fixation outputs to end users—Western Region	1 Jul 2012	30 Jun 2017
CSIRO, IAC	IAC00002	Surveillance and forecasts for mouse outbreaks in Australian cropping systems	1 Oct 2012	30 Sep 2015
CSIRO, DAN, ICC, PAA	ICF00008	Soils under an irrigated environment	1 Jul 2014	30 Jun 2017
IMBcom, UQ, UTS	IMB00001	Insecticidal peptides from natural predators	30 Jun 2010	30 Sep 2014
Aglime, LIE, MIG, Southern DiRT, West Midlands Group	LIE00008	Working together to deliver multiple benefit messages to growers through a whole systems approach to soil management	31 Mar 2014	30 Jun 2017
AgResearch, Lincoln University, SARDI, UCS	LUN00001	Reducing the impact of the parasitic root lesion nematode on cereal crops	1 Jul 2011	30 Jun 2015
Agriculture, MCG	MCC00011	National Agricultural Nitrous Oxide Research Program—Evaluation of performance	15 Oct 2012	30 Jun 2015
CSIRO, DA, DAW, HIA, MLA, RIRDC, SRA, UMU	MCV00013	Temperature extremes and cropping in Western Australia	1 Mar 2010	31 May 2015
BOM, DA, DAW, HIA, MLA, RIRDC, SRA	MCV00031	Predictions of heat extremes on multiweek to seasonal timescales	30 Jun 2011	30 Dec 2014
DA, DAW, HIA, MLA, RIRDC, SRA	MCV00035	Managing Climate Variability Program Phase 4—Program coordinator	1 Aug 2013	30 Jun 2015
CSIRO, DA, DAW, HIA, MLA, RIRDC, SRA	MCV00036	Predictive Ocean Atmosphere Model for Australia seasonal forecast value	1 Jun 2014	30 Nov 2016
DA, DAW, HIA, MLA, QUT, RIRDC, SRA	MCV00037	Can advances in mid-term weather forecasts reduce emissions from nitrogen fertiliser?	1 Jul 2013	30 Jun 2016
DA, DAW, HIA, MLA, RIRDC, SRA	MCV00038	Australian CliMate development	23 Jun 2014	30 Aug 2016
DA, DAW, HIA, MLA, RIRDC, SRA	MCV00039	Managing Climate Variability Program Phase 4—Independent chair	1 Jul 2013	30 Jun 2016
DA, DAW, HIA, MLA, RIRDC, SRA	MCV00040	Managing Climate Variability Program Phase 4—Project management committee	1 Jul 2013	30 Jun 2016
BOM, DA, DAW, HIA, MLA, RIRDC, SRA	MCV00041	Improved skill for regional climate in the ACCESS-based Predictive Ocean Atmosphere Model for Australia	23 Jun 2014	28 Feb 2017
DA, DAW, HIA, MLA, RIRDC, SRA	MCV00042	Managing Climate Variability Program Phase 4—Communication support and administration	1 Jul 2013	30 Jun 2016
DA, DAW, HIA, MLA, RIRDC, SRA	MCV00043	Managing Climate Variability Program Phase 4—CRDC Climate Champion	1 Jul 2014	30 Jun 2015
MFM, SARDI	MFM00007	Viable crop and/or pasture legumes for alkaline soils in the high-rainfall zone	1 Jan 2015	30 Jul 2015



GRDC partners	Project ID	Project	Start	Finish
ANU, CSIRO, DEST, UNS, UQ, UWA	NYS00002	National Youth Science Forum	1 Jul 2011	30 Jun 2015
AOF, DAN, PAL	PAL00019	Australian broadleaf cropping project	1 Sep 2013	31 Aug 2016
DAQ, PBC, UWA	PBC00001	Economic analyses of gene deployment strategies for high-priority exotic pests and chemical supply to manage pest incursions	1 Aug 2012	1 Dec 2014
PBC, PHA, QUT, UMU	PBC00002	Extending biosecurity preparedness and surveillance strategies and developing a chemical supply framework for pest incursions	1 Oct 2012	30 Jun 2017
DAQ, PBC, SARDI, USQ	PBC00003	New tools for field grains surveillance and diagnostics of high-priority pests	1 Jul 2012	30 Jun 2017
DAQ, PCA	PCA00001	Australian Peanut Genetic Improvement Program	1 Jul 2007	30 Jun 2015
AKC Consulting, PHA	PHA00010	Development of pre-emptive Australian Pesticides and Veterinary Medicines Authority emergency permits for exotic plant pest incursion containment and control	30 Jun 2013	30 Jun 2016
Australian Environment Agency, CSIRO, PHA	PHA00014	Determining equivalent zones of agriculture for the generation of registration data	1 Apr 2014	31 Dec 2015
DAQ, QUT	QUT00005	New technology for stored grain pest management	1 Mar 2012	30 Jan 2015
DAQ, QUT	QUT00006	New technology for stored grain pest management—Phase 2	1 Jun 2015	30 May 2017
AgBiTech, QUT	QUT00007	A new biopesticide for diamondback moth management in canola	30 Jun 2014	31 Dec 2016
RIRDC	RDC00008	Contribution to the Collaborative Venture for Farming and Fishing Health and Safety Initiative	1 Jul 2012	30 Jun 2017
RIRDC	RDC00009-1	National Oat Breeding Program—Healthy and productive grain varieties for the future	1 Jul 2012	30 Jun 2015
RIRDC	RDC00010	Horizon Scholarship sponsorship	1 Jun 2013	1 Mar 2018
RIRDC	RDC00011	Horizon Scholarship sponsorship	1 Jul 2014	30 Jun 2019
FAR, PAL, RPI	RPI00009	Maintaining profitable farming systems with retained stubble—Riverine Plains region	30 Jun 2013	30 Jun 2018
Bill Gordon Consulting, PCB Consulting, Roth Rural & Regional, US	RRR00003	Grain production stewardship modules	5 Dec 2013	30 Jun 2015
NRS, SFS	SFS00026	Soil acidity is limiting grain yield—Southern Victoria component	1 Jan 2014	30 Jun 2018
Ag Excellence Alliance, BCG, MSF, SARDI, SFS	SFS00028	Grain and Graze 3—Extension and delivery of mixed farming benefits in the Southern Region	1 Jan 2014	31 Dec 2017
ACPF, SARDI, UA	UA00115	Improving phosphorus use efficiency in wheat and barley	1 Jul 2009	30 Jun 2016
DAV, UA, ULA, UNE	UA00119	Assessing management options for enhanced soil phosphorus availability using rotations	1 Jan 2011	31 Dec 2015
DAN, DAQ, DAW, UA, UWA	UA00124	Understanding and management of resistance to Group M, Group L and Group I herbicides—National project	1 Jun 2011	30 Jun 2015
DAW, UA	UA00126	Increasing malt extract and the export competitiveness of Australian barley	30 Jun 2011	5 Feb 2015
DAN, SARDI, UA, US	UA00127	Pulse Breeding Australia—Australian Faba Bean Breeding Program	30 Jun 2011	30 Jun 2016
ACPF, SARDI, UA	UA00133	Late maturity alpha-amylase in wheat	1 Jul 2011	30 Jun 2015
UA, USA	UA00135	Improved functionality of grain storage products	1 Jan 2015	30 Jun 2016



GRDC partners	Project ID	Project	Start	Finish
DAW, UA	UA00136	Australian National Frost Program—Coordination and phenotyping	1 Jul 2011	30 Jun 2016
SARDI, UA	UA00138	Extension of nitrogen fixation program outputs to end users—Southern Region	1 Jul 2012	30 Jun 2017
CSIRO, UA	UA00139	More Profit From Crop Nutrition II—Tactical foliar phosphorus fertilisation of dryland crops	1 Mar 2013	1 Mar 2016
CIMMYT, UA, UWA	UA00141	Advancement of new stem genes for stem and leaf rust resistance from uncultivated relatives of wheat	1 Jul 2012	30 Jun 2017
CSIRO, UA, UWA	UA00145	Development of salinity-tolerant wheat and barley	1 Jul 2013	31 Dec 2016
ACPGF, SARDI, UA	UA00150	Late maturity alpha-amylase: A molecular marker based, high-throughput, precise screening protocol	1 Jul 2014	30 Jun 2018
AGT, UA	UA00152	Genomic selection: Development and utilisation in a commercial wheat-breeding program	1 Jun 2014	1 Jun 2017
DAQ, DAV, SARDI, UA	UA00155	More Profit From Crop Nutrition II—Nutrient stratification and sub-surface soil testing	3 Jan 2015	12 Oct 2015
DAN, DAW, UA, UQ	UA00156	Emerging weeds—Seed-bank biology of emerging weeds	1 May 2015	30 Jun 2020
UB, NRS, SFS	UB00003	Online farm trials research—Developing new technologies to improve access to and adoption of research findings	5 Jun 2013	30 Jun 2016
UA, UCS	UCS00020	Weed management in the Southern Region mixed farming systems—Strategies to combat herbicide resistance	30 Jun 2013	30 Jun 2018
SARDI, UD, UF	UF00008	Beneficial Microbes Program 2—Progressing new microbial products for Australian grain production to commercialisation.	1 Jul 2013	30 Jun 2017
AEC, Agriculture, AGWA, AMPC, APL, AWI, CRDC, CSIRO, DA, DAN, DAQ, DAT, DAV, DAW, DNT, FRDC, FWPA, HIA, MLA, RIRDC, SARDI, UM	UM00044	Climate change research strategy for primary industries participants agreement	1 Jun 2011	30 Jun 2016
SARDI, UM, UWA	UM00045	Expanding the brassica germplasm base through collaboration with China and India	1 Jul 2011	30 Jun 2017
SARDI, UM	UM00047	Novel, highly targeted, low environmental impact control of pest slugs and snails	1 Mar 2013	31 Oct 2015
CES, UM	UM00048	National coordination of invertebrate pest research and insecticide resistance management	1 Jul 2013	30 Jun 2018
CES, CSIRO, DAW, UM, UWA	UM00049	Management of insecticide resistance in redlegged earth mite and screening new mode of action chemistry	30 Jun 2013	30 Jun 2016
ULA, UM, UWA	UM00050	'Proof of concept' for approaches designed at increasing disease resistance to fungal pathogens of canola	30 Jun 2013	30 Jun 2018
CSIRO, DAN, DAW, MGP, SARDI, UM	UM00051	National canola pathology program including new molecular knowledge, pathogen evolution and control technologies	1 Jun 2013	30 Jun 2018
DAN, DAV, UM	UM00052	Improving grower surveillance, management, epidemiology knowledge and tools to manage crop disease—National chickpea pathology program	30 Jun 2013	30 Jun 2018
CSIRO, UM	UM00054	Theme PhD Scholarship—(UM) Predicting insect pest issues in Australian grain crops	10 Mar 2014	9 Mar 2017
SARDI, UM	UM00055	Control of grain pest molluscs	30 Jun 2014	30 Jun 2016



GRDC partners	Project ID	Project	Start	Finish
ACPF, UMU	UMU00037	International Wheat Genome Sequencing Consortium assembly of chromosome 7A	1 Jul 2010	31 Dec 2015
DAW, UMU, UT	UMU00038	Improved adaptation of barley to acid soils	1 Jul 2011	31 Dec 2015
DAW, UMU	UMU00040	Maintenance of rhizobial germplasm resources	1 Jul 2012	30 Jun 2017
DAW, UMU	UMU00041	More Profit from Crop Nutrition II—Assessing the nutritional benefits of clay amendment and cultivation of sands	1 Jul 2012	31 Jan 2016
FG, UMU	UMU00042	More Profit From Crop Nutrition II—Managing potassium nutrition to alleviate crop stress	1 Jul 2012	30 Jun 2015
DAW, FG, UMU	UMU00045	Farming systems to improve crop tolerance to frost: Crop nutrient management	1 Jul 2014	30 Jun 2016
DAW, UMU, UT	UMU00046	Improved adaptation of barley to acid soils	1 Jan 2015	30 Jun 2020
AGT, DAW, UM	UMU00048	Genetic approaches to reduce the nitrogen dilution effect and increase nitrogen-use efficiency in wheat	1 Jun 2015	31 May 2020
CSIRO, UNE	UNE00020	More Profit From Crop Nutrition II—Quantifying and understanding root variation in winter cereals	30 Jun 2013	30 Jun 2016
SARDI, UNE	UNE00021	Field trials of attract-and-kill for diamondback moth	1 Apr 2014	31 Oct 2016
DAN, DAQ, DSITI, UNE	UNE00022	More Profit from Crop Nutrition II—Evaluating testing methods for phosphorus and potassium soil reserves	1 Mar 2015	30 Mar 2019
DAN, DAQ UQ	UQ00062	Improving integrated weed management practice in the Northern Region	1 Jul 2011	30 Jun 2016
DAN, DAQ, DSITI, UNE, UQ	UQ00063	More Profit from Crop Nutrition II—Regional soil-testing guidelines for the northern grains region	1 Jul 2012	30 Jun 2017
DAN, DAQ, DSITI, QUT, UQ	UQ00066	More Profit from Crop Nutrition II—Defining nitrogen response surfaces for sorghum and canola in the northern grains region	1 Jul 2012	30 Jun 2015
DAQ, UQ, US	UQ00073	National barley coordination project	30 Jun 2014	30 Jun 2018
Conservation Farmers, UQ	UQ00075	Tactical crop agronomy for maize and sorghum in the Northern Region	1 Jul 2014	30 Jun 2017
DAN, DAQ, UNE, UQ	UQ00078	More Profit from Crop Nutrition II—Deep placement of nutrients	1 May 2015	30 Jun 2019
DAN, DAQ, DAV, DAW, QUT, UQ, UWA	UQ00079	More Profit from Crop Nutrition II—Organic matter and nutrient availability	4 Apr 2015	30 Dec 2015
CSIRO, DSITI, UQ	UQ00081	Costs of edaphic stress to the Australian grains industry	1 Jun 2015	30 Jun 2017
AGT, US	US00049	National Triticale Improvement Program	1 Jul 2009	30 Jun 2015
CIMMYT, SARDI, US	US00054	Crown rot germplasm enhancement for wheat : University of Sydney and SARDI components	1 Jul 2010	30 Jun 2015
ANU, US	US00056	Research Project 1: Superior water-use efficiency through improved mesophyll conductance	1 Apr 2012	31 Mar 2017
DAN, US	US00065	Understanding the molecular basis for desiccation tolerance of rhizobia for improved survival on seed	1 Jul 2013	30 Jun 2017
DAN, US	US00067	Australian Cereal Rust Control Program—Towards 2019 and a century of monitoring cereal rust pathogens in Australia	1 Jul 2012	30 Jun 2017
UQ, US, USQ	US00069	Enhancing human capacity for soil knowledge transfer and decision making for a sustainable grains industry	1 Nov 2013	31 Mar 2016



GRDC partners	Project ID	Project	Start	Finish
AGT, DAN, DAV, DAW, UA, UQ, US	US00073	Exploitation of international grains in Australia: Coordinated importation, quarantine and evaluation, data management and communication	30 Jun 2014	29 Jun 2018
DAN, USQ	USQ00012	Enhanced germplasm for crown rot in winter cereals through application of molecular markers	1 Jul 2010	30 Jun 2015
DAN, DAQ, SARDI, USQ	USQ00013	Managing crop diseases—Improving crown rot resistance in durum	1 Jun 2013	30 Jun 2018
DAW, NRS, USQ,UWA	USQ00016	The components of risk in farm profit	1 Jul 2014	30 Sep 2015
CSIRO, SAGIT, UQ, UT	UT00024	The role of canopy architecture in improving the water-limited yield of wheat lines contrasting in the 'tin' gene	30 Jun 2012	30 Jun 2015
UA, UCS, UW, UWA	UW00004	Capacity building for statistics	1 Jul 2010	30 Jun 2016
CUR, DAQ, UA, UCS, UW, UWA	UW00005	Statistics for the Australian Grains Industry	1 Jul 2011	30 Jun 2016
DAN, DAQ, DAW, UA, UQ, UWA	UWA00124	Efficacy of the Harrington Seed Destructor in targeting weed seeds during the harvest of Australian grain crops	1 Oct 2008	30 Jun 2015
CSIRO, UWA	UWA00145	Innovative approaches to resistance to necrotrophic pathogens and sap-sucking insect pests	1 Jul 2010	30 Jun 2016
DAQ, DAW, Planfarm, UCS, UWA	UWA00146	Australian Herbicide Resistance Initiative—Phase 4	1 Jul 2010	30 Jun 2015
CSIRO, UWA	UWA00151	Unleashing the power of genomics for lupin marker development and crop improvement	1 Jul 2011	30 Jun 2015
CSIRO, UWA	UWA00154	Strategies to provide resistance to the economically important fungal pathogen <i>Rhizoctonia solani</i>	1 Jun 2012	30 Jun 2016
DAW, UWA	UWA00156	More Profit from Crop Nutrition II—Nitrogen fertiliser response curves: Filling the gap for Western Australia	1 Jul 2012	30 Jun 2015
DAW, UWA	UWA00158	Detection and epidemiology of winter/spring aphids and redlegged earth mites	1 Nov 2012	30 Sep 2015
UWA, WANTFA	UWA00163	Long term no-till farming systems	1 Jul 2013	30 Jun 2016
DAW, SARDI, UQ, UWA	UWA00165	Options for improved insecticide and fungicide use and canopy penetration in cereals and canola	1 Nov 2013	30 Jun 2016
DAQ, DAW, UQ, UWA	UWA00169	Use of chemicals to increase frost tolerance in Australian crops	1 Jul 2014	30 Jun 2016
DAN, ICC	VIC00010	Correct crop sequencing for irrigated double cropping	1 Jul 2013	30 Jun 2016
CSIRO, DAW, Planfarm, UWA, WANTFA	WAN00021	Dry seeding in Western Australia	13 Jan 2013	30 Jun 2017
AEGIC, BA, ECU	WCA00003	Pilot Malting Australia—Commercial malting validation	1 Jan 2013	31 Dec 2015
UCS, DAN, DAQ, Planfarm, UWA	UWA00171	Australian Herbicide Resistance Initiative—Phase 5	30 Jun 2015	30 Jun 2020
Ag Consulting Co, Agrilink, Yeruga Crop Research	YCR00003	Maintaining profitable farming systems with retained stubble—Yorke Peninsula and the Mid North of South Australia	1 Jul 2013	30 Jun 2018



ABARES = Australian Bureau of Agricultural and Resource Economics and Sciences, ACO = AgCommunicators, ACPFG = Australian Centre for Plant Functional Genomics, AEC = Australian Egg Corporation, AEGIC = Australian Export Grains Innovation Centre, Agriculture = Department of Agriculture, AGT = Australian Grain Technologies, AGWA = Australian Grape and Wine Authority, AMC = Allan Mayfield Consulting, AMPC = Australian Meat Processor Corporation, ANU = Australian National University, AOF = Australian Oilseeds Federation, APL = Australian Pork Limited, ARC = Australian Research Council, AVRDC = AVRDC—The World Vegetable Center, AWI = Australian Wool Innovation, BA = Barley Australia, BCG = Birchip Cropping Group, BOM = Bureau of Meteorology, BPC = Back Paddock Company, CAS = Australian Crop Accreditation System, CES = cesar, CIMMYT = International Maize and Wheat Improvement Center, CRDC = Cotton Research and Development Corporation, CSIRO = Commonwealth Scientific and Industrial Research Organisation, CUR = Curtin University of Technology, CWFS = Central West Farming Systems, DA = Dairy Australia, DAN = Department of Primary Industries New South Wales, DAQ = Department of Agriculture and Fisheries Queensland, DAT = Department of Primary Industries, Parks, Water and Environment Tasmania, DAV = Department of Economic Development, Jobs, Transport and Resources Victoria, DAW = Western Australian Agriculture Authority, DEST = Department of Education and Training, DNT = Department of Land Resource Management Northern Territory, DSITI = Department of Science, Information Technology and Innovation Queensland, ECU = Edith Cowan University, FAR = Foundation for Arable Research, FG = Facey Group, FLR = FarmLink Research, FRDC = Fisheries Research and Development Corporation, FWPA = Forest and Wood Products Australia, GGL = GrainGrowers, GPC = Global Pasture Consultants, GRDC = Grains Research and Development Corporation, HIA = Horticulture Innovation Australia, IAC = Invasive Animals Cooperative Research Centre, ICAN = Independent Consultants Australia Network, ICARDA = International Center for Agricultural Research in the Dry Areas, ICC = Victorian Irrigated Cropping Council, ICRISAT = International Crops Research Institute for the Semi-Arid Tropics, IP = Incitec Pivot, LIE = Liebe Group, MCG = Mackellar Consulting Group, MFM = MacKillop Farm Management Group, MGP = Marcroft Grains Pathology, MIG = Mingenew Irwin Group, MLA = Meat and Livestock Australia, MSF = Mallee Sustainable Farming, NRS = Nicon Rural Services, PAA = Precision Agronomics Australia, PAL = Pulse Australia, PBA = Pulse Breeding Australia, PBC = Plant Biosecurity Cooperative Research Centre, PCA = Peanut Company of Australia, PHA = Plant Health Australia, QUT = Queensland University of Technology, RIRDC = Rural Industries Research and Development Corporation, RPI = Riverine Plains Inc, RSS = Rural Solutions South Australia, SAGIT = South Australian Grains Industry Trust, SANTFA = South Australian No-Till Farmers Association, SARDI = South Australian Research and Development Institute, SFS = Southern Farming Systems, SRA = Sugar Research Australia, UA = University of Adelaide, UB = Federation University Australia, UCS = Charles Sturt University, UD = Deakin University, UF = Flinders University, ULA = La Trobe University, UM = University of Melbourne, UMU = Murdoch University, UNE = University of New England, UNFS = Upper North Farming Systems, UNS = University of New South Wales, UQ = University of Queensland, US = University of Sydney, USA = University of South Australia, USC = Southern Cross University, USDA = United States Department of Agriculture, USQ = University of Southern Queensland, UT = University of Tasmania, UTS = University of Technology Sydney, UW = University of Wollongong, UWA = University of Western Australia, UWS = University of Western Sydney, VNTFA = Victorian No-Till Farmers Association, WANTFA = Western Australian No-Tillage Farmers Association, WQA = Wheat Quality Australia Limited



# Appendix D – Publications

The GRDC delivers a wide range of information products, in printed and electronic formats.

Most of the GRDC's electronic publications are available for download, free of charge, through the GRDC website. The website also provides a catalogue of GRDC publications and links to the GRDC's distribution service, Ground Cover Direct.

Items in print or on CD or DVD can be ordered through Ground Cover Direct by phone (freecall 1800 11 00 44), fax, email or post. Most are available for the cost of postage and handling only. Some books are sold at a price, to fully or partially recover the costs of publication.

## New publications in 2014–15

### Corporate publications

Governance	GRDC Annual Report 2013–14 GRDC Growers' Report 2013–14 GRDC Stakeholder Report 2015–16 GRDC Annual Operational Plan 2015–16
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Products	Ground Cover Direct publications catalogue: <ul style="list-style-type: none"> <li>• November 2014 – April 2015</li> <li>• May 2015 – October 2015</li> </ul>
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### Fact sheets

National	Grain Marketing and Pesticide Residues Wild Radish Electronic fact sheets: <ul style="list-style-type: none"> <li>• Resistance Management Strategy for the Green Peach Aphid in Australia</li> <li>• Blackleg Management Guide Fact Sheet (revised)</li> <li>• Storing Pulses (revised)</li> <li>• Pre-harvest Herbicide Use</li> <li>• Pre-emergent Herbicide Use</li> <li>• In-crop Herbicide Use (revised)</li> </ul>
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Northern Region	Electronic fact sheets: <ul style="list-style-type: none"> <li>• Safe Storage of Sunflower Seed</li> <li>• Sunflower Disease Management</li> <li>• Denitrification</li> <li>• Group A Herbicides in Fallow</li> <li>• Root-lesion Nematodes</li> </ul>
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Southern Region	Managing People in the Farm Business—Being an Effective Leader Electronic fact sheets: <ul style="list-style-type: none"> <li>• Early-sowing Wheat in Victoria</li> <li>• Root-lesion Nematodes</li> <li>• Spring-sown Winter Canola</li> <li>• Snail Bait Application (Yorke Peninsula, South Australia)</li> <li>• Clay Spreading and Delving</li> </ul>
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Western Region	Electronic fact sheet: Root-lesion Nematodes
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Northern and Southern regions	Grain Protectants Prevent Pests
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Southern and Western regions	Reducing Aphid and Virus Risk
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## New publications in 2014–15

### Manuals and guides

Crop management	<p>2015 Paddock Diary</p> <p><i>Adjuvants: Oils, Surfactants and Other Additives for Farm Chemicals</i> (revised)</p> <p><i>Crop Aphids: The Back Pocket Guide</i></p> <p>GrowNotes (electronic flip books)</p> <ul style="list-style-type: none"> <li>Northern Region: Canola, Faba Beans, Field Peas, Maize, Peanuts, Safflower, Sorghum, Sunflowers</li> <li>Southern Region: Canola</li> <li>Western Region: Canola, Wheat</li> </ul> <p><i>Inoculating Legumes: The Back Pocket Guide</i> (revised)</p> <p>Nozzle Selection Guide Poster (revised)</p> <p><i>Soil Behaviour of Pre-Emergent Herbicides in Australian Farming Systems: A Reference Manual for Agronomic Advisers</i></p> <p><i>Summer Fallow Weed Management (Southern and Western regions)</i></p>
Farm business management	<p><i>2015 Farm Gross Margin Guide</i></p> <p><i>A Guide to Farm Labour—How to Find and Retain On-farm Staff</i></p> <p><i>Farming the Business</i> (hard copy, electronic copy and eBook)</p>
Research, development and extension	<p><i>'In GRAINS' Investing in Young Scientists</i></p> <p><i>Combatting Non-wetting Soils: A Tour of On-farm Research in Western Australia, 2014</i></p> <p><i>From the Ground Up: Annual Report for Regional Cropping Solutions Networks 2013–14—Southern Region</i></p> <p><i>From the Ground Up: Annual Report for Regional Cropping Solutions Networks 2013–14—Western Region</i></p> <p>Summaries of GRDC-supported projects in 2013–14 (GRDC website)</p>
Varieties	<p><i>2015 Wheat Variety Guide for Western Australia</i></p> <p><i>2015 Barley Variety Sowing Guide for Western Australia</i></p> <p><i>National Variety Trials (NVT) Queensland Wheat Variety Guide 2015</i></p> <p><i>NVT Victorian Winter Crop Summary 2015</i></p> <p><i>SA Sowing Guide 2015</i></p>

### Periodicals

<i>CLIMAG</i> (Managing Climate Variability program)	Issue 26
Driving Agronomy CDs	<p>Northern Region (November 2014)</p> <p>Southern Region (November 2014)</p> <p>Western Region (November 2014)</p>
<i>Farm Business Update</i>	Issues 23, 24, 25, 26, 27 and 28
<i>Grains Research Update</i>	<p>Northern Region: Diary Dates and E-Newsletter for July, August, September, October, November and December 2014 and January, February, March, April, May and June 2015</p> <p>Southern Region: Issues 31, 32, 33, 34, 35 and 36</p>
<i>Ground Cover</i> and <i>Ground Cover</i> supplements	<p>Six issues, all with supplements:</p> <ul style="list-style-type: none"> <li>Issue 111: Root and Crown Diseases</li> <li>Issue 112: Managed Environment Facilities</li> <li>Issue 113: Grain and Graze</li> <li>Issue 114: Climate Forecasting</li> <li>Issue 115: Profitable Pulses and Pastures</li> <li>Issue 116: Foliar Fungal Diseases of Pulses and Oilseeds</li> </ul>
Ground Cover DVDs	<p>Episode 14 (September–October 2014)</p> <p>Episode 15 (January–February 2015)</p> <p>Episode 16 (May–June 2015)</p>



# Appendix E— Selection committee report

## Grains Research and Development Corporation Selection Committee

The Hon. Barnaby Joyce  
Minister for Agriculture  
Parliament House  
CANBERRA ACT 2600

Dear Minister

### Grains Research and Development Corporation Selection Committee Report 2015

This report summarises the activities of the Grains Research and Development Corporation (GRDC) selection committee from 16 May to 23 July 2014, pursuant to section 141 of the *Primary Industries Research and Development Act 1989* (PIRD Act), in relation to the nomination of seven directors for appointment to the GRDC Board.

#### Establishment of the selection committee

The GRDC selection committee was established under the PIRD Act for the purpose of nominating to you seven persons for appointment as directors of the GRDC.

I was appointed by you as presiding member on 16 April, for the period ending 31 March 2017. On 5 June 2014, following discussions with the GRDC's representative industry organization Grain Producers Australia (GPA), you appointed the selection committee as follows:

- Mr Andrew Earle
- Ms Alexandra Gartmann
- Prof Alistar Robertson
- Ms Fiona Simson

#### Selection process

Applications were called through advertisements placed in the following newspapers:

- Friday 30 May 2014, The Australian Financial Review
- Saturday 31 May 2014, The Australian (weekend edition)
- Week of 2 June 2014, Rural Press publications

Details of the director vacancies were distributed through a range of electronic networks covering websites for:

- GRDC
- Women on Boards
- Balance Database
- BoardLinks
- AusGovBoards
- Australian Rural Leadership Foundation
- Nuffield Australia Farming Scholars

A total of 234 applications were received, of which 68 (30% of total) were received from female applicants. The GRDC's representative industry organisation, Grain Producers Australia was also invited to nominate candidates for consideration by the selection committee. Existing GRDC directors were also invited to apply and six applied.

Applications closed on 13 June 2014.

In accordance with the PIRD Act, the advertisements called for written applications against the following criteria:

- Grains production, processing and marketing
- Conservation and management of natural resources
- Science
- Technology and Technology transfer
- Environmental and ecological matters
- Economics
- Administration of research and development



- Finance and business management
- Communication
- Public administration

All candidates were also required to have:

- An understanding of corporate governance and directors' responsibilities
- Good communication skills and the capacity to represent GRDC to all stakeholders

The GRDC Chair and Managing Director were consulted and provided the selection committee with a detailed briefing on the Corporation and its strategic direction immediately prior to the short listing process.

In developing the shortlist, the selection committee took into account the core selection criteria contained in the PIRD Act, along with other criteria agreed as important including:

- Strong strategic thinking
- Demonstrated experience in corporate accountability
- Awareness and understanding of the international research & development environment in both public and private sectors
- Demonstrated experience in commercial deal brokerage
- Geographical diversity of production experience and knowledge
- Effective implementation and management of change

The selection committee met on 30 June 2014 to review the applications. The committee unanimously agreed to a shortlist of 15 candidates for interview, including 5 women and 6 existing directors.

Interviews were conducted on 9 and 10 July 2014 at the Stamford Plaza Hotel, Sydney Airport.

Following interviews the selection committee made its final decisions, taking into account the collective balance of expertise and experience in board affairs required by the PIRD Act.

### Board appointments

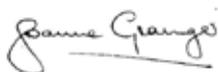
Upon completion of the selection process, the GRDC selection committee reported to you with seven nominations and the names of two other candidates, considered suitable for appointment, for your consideration. From these, you appointed the following directors:

- Dr Andrew Barr, new appointment, resident of South Australia
- Dr Jeremy Burdon, reappointment, resident of the Australian Capital Territory
- Dr Helen Garnett, new appointment, resident of Northern Territory
- Ms Roseanne Healy, new appointment, resident of South Australia
- Mr Kim Halbert, reappointment, resident of Western Australia
- Mr David Shannon, new appointment, resident of South Australia
- Mr John Woods, reappointment, resident of New South Wales

### Expenses

Item	\$
Selection Committee and applicants' travel, accommodation and expenses	19,257
Advertising	10,488
Selection Committee members' fees (excluding the Presiding Member)	2,304
Presiding Member's fees	16,408
Secretariat Costs (supporting the selection committee)	4,770
<b>Total (excluding GST)</b>	<b>53,227</b>

Yours sincerely



Joanne Grainger  
 Presiding Member  
 Grains Research and Development Corporation Selection Committee  
 10 July 2015



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Photo: Chris Stacey

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# Abbreviations list

Term	Meaning
ABARES	Australian Bureau of Agricultural and Resource Economics and Sciences
APSIM	Agricultural Production Systems sIMulator
APVMA	Australian Pesticides and Veterinary Medicines Authority
CIMMYT	International Maize and Wheat Improvement Center
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DE	diatomaceous earth
ESD	ecologically sustainable development
GPA	Grain Producers Australia Limited
GRDC	Grains Research and Development Corporation
GST	goods and services tax
ICARDA	International Center for Agricultural Research in the Dry Areas
LMA	late maturity alpha-amylase
PBR	plant breeder's rights
PGPA Act	<i>Public Governance, Performance and Accountability Act 2013</i>
PIRD Act	<i>Primary Industries Research and Development Act 1989</i>
POAMA	Predictive Ocean Atmosphere Model for Australia
QTL	quantitative trait loci
RCSNs	Regional Cropping Solutions networks
R&D	research and development
RD&E	research, development and extension
SARDI	South Australian Research and Development Institute
SLG	Senior Leadership Group
TFP	total factor productivity
WHS	work health and safety
WLYP	water-limited yield potential



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## Contact details

<b>Location</b>	Level 4 East Building, 4 National Circuit BARTON ACT 2600
<b>Postal address</b>	GRDC PO Box 5367 KINGSTON ACT 2604
<b>Contact officer</b>	Manager Strategy and Governance Telephone: 02 6166 4500 Fax: 02 6166 4599 Website: <a href="http://www.grdc.com.au">www.grdc.com.au</a> Email: <a href="mailto:grdc@grdc.com.au">grdc@grdc.com.au</a>

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The **Grains Research and Development Corporation** is a corporate Commonwealth entity established to plan and invest in research, development and extension (RD&E) for the Australian grains industry.

Its primary objective is to drive the discovery, development and delivery of world-class innovation to enhance the productivity, profitability and sustainability of Australian grain growers and benefit the industry and the wider community.

Its primary business activity is the allocation and management of investment in grains RD&E.

## **GRDC Vision**

A profitable and sustainable Australian grains industry, valued by the wider community.

## **GRDC Mission**

Create value by driving the discovery, development and delivery of world-class innovation in the Australian grains industry.

## **GRDC Values**

We are **committed** and **passionate** about the Australian grains industry.

We value **creativity** and **innovation**.

We build strong relationships and partnerships based on mutual **trust** and **respect**.

We act **ethically** and with **integrity**.

We are **transparent** and **accountable** to our stakeholders.

A wide-angle photograph of a vast, golden wheat field stretching to the horizon. The sky above is dark and filled with heavy, grey clouds, suggesting an approaching storm or late afternoon light. The wheat stalks are in sharp focus in the foreground, showing their texture and color. In the distance, a few small white buildings are visible on the horizon line.

*Your GRDC working with you*