Australian Government

Department of Agriculture, Fisheries and Forestry

Submission to

Productivity Commission inquiry into the Australian Government Rural Research and Development Corporations Model

August 2010

Contents

Executive summary		i
	Key points	v
1.	**Agriculture, fisheries and forestry and food industry characteristics and their importance to Australia**	**1**
1.1	Characteristics	1
1.2	Economic, social and environmental importance	3
1.2.a	Importance to rural and regional communities	3
1.2.b	Important Nationally	4
1.2.c	Important internationally	4
1.3	Challenges facing the agricultural sector	5
1.3.a	Terms of trade and value of production	5
1.3.b	Climate change	7
1.3.c	Global food Security	9
1.3.d	Skills shortages	10
2.	**Investment in rural R&D**	**11**
2.1	Rationale for government involvement in rural R&D	11
2.2	Impact of rural R&D investment in Australia	12
2.2.a	Rural R&D expenditure	12
2.2.b	R&D and productivity growth	14
2.2.c	Drivers of historical productivity growth	16
3.	**How the rural innovation system works and the rural R&D corporations**	**17**
3.1	Rural R&D in Australia and the position of the RDCs	17
3.2	The evolution of the RDC model and its features	18
3.3	Funding of RDCs	24
3.3.a	Levies	26
3.4	Governance of RDCs	27
3.4.a	R&D plans	27
3.4.b	Annual Operational Plans	28
3.4.c	Industry-owned companies/government funding agreements	28
3.4.d	Accountability to stakeholders	28
3.5	R&D priority setting	29
3.6	Implementing investment funds and relationships with research providers and other funders	31
3.6.a	National Primary Industries Research, Development and Extension Framework	31
3.6.b	Rural Research and Development Council	32
3.7	International linkages	33
3.8	Intellectual Property	34
3.9	Extension and adoption of RDC research findings	36
3.10	Evaluation	37

4.	**Discussion of key issues**	**39**
4.1	Comparing international rural R&D models	39
4.2	Other Australian business program funding models	40
4.3	The role and influence of the RDCs	42
4.4	RDCs' response to stakeholder priorities	42
4.5	RDCs' accountability to stakeholders	45
4.6	Collaboration and co-investment between RDCs against rural R&D priorities	45
4.7	Administrative efficiency of RDCs	46
4.8	Scale and spread of RDC projects	46
4.9	Industry size and R&D capacity	47
5.	**Looking to the future**	**48**
5.1	Government's ongoing role in investment in agricultural R&D	48
5.2	Is the RDC model right for delivering rural R&D investment?	48
5.3	Funding rural R&D – private versus public investment	50
5.4	Changes to RDCs – recent and current	51
5.4.a	Recent changes	51
5.4.b	Current changes	51
5.5	Further room for modification	52
Appendix A	Levy legislation	54
Appendix B	Levy rates	55
Appendix C	List of rural RDCs	61
	Glossary	62
	References	64

Executive summary

Innovation has been a key factor in the rural sector's long history of productivity growth and contribution to Australia's prosperity, with productivity growth being strong compared to other sectors in the economy. This has been supported by ongoing investment in rural research and development (R&D), which continues to be of paramount importance to the rural sector.

Australian agriculture is strongly export oriented, and competes in an international market that is distorted by high tariffs, farm subsidies, and non-tariff barriers among competing countries. A key plank in the agriculture, fisheries and forestry policy of successive Australian Governments' has been to increase industry productivity and competitiveness by supporting rural R&D, rather than through other more market distorting forms of assistance.

The rural research and development corporation (RDC) model was originally established under the *Primary Industries and Energy Research and Development Act 1989*, and has evolved according to industry needs and government policy. The original rationale for the government's involvement (recognition of the spillover benefits to the community, the substantial risks in some investment, and the potential for "free riding" by producers) and the policy principles behind the design of the RDC model are still valid and current twenty years later.

With the significant declines in agricultural prices in real terms since 1974-75, Australian farmers have relied on productivity increases to maintain their competitiveness in international markets and sustain their businesses and incomes. The rural sector is also being challenged by climate change, and competition for finite natural resources and skilled human resources. This means there is much greater pressure to improve productivity growth in the rural sector. Increasing global demand for food also creates an opportunity for Australia to supply a greater share of global food needs.

Productivity growth is influenced by a range of factors, including innovation and investment in research, development and extension (RD&E). While over recent decades productivity growth in agriculture has been high, analysis conducted by the Australian Bureau of Resource Economics (ABARE) indicates agricultural productivity trends vary greatly between industries. Analysis from ABARE also indicates there is strong evidence of a slowdown in growth in the cropping and mixed crop-livestock industries. This slowdown in productivity growth cannot be explained by drought conditions alone.

The level of public investment in RD&E is estimated to have declined in recent years (Sheng, Mullen and Zhao, 2010), particularly as state governments have reduced their traditional research, development and extension services. While the effect of RD&E expenditure can be difficult to measure because of the long lags between investment in research and productivity gain, ABARE has suggested the decline in public RD&E investment is likely to have contributed to the slowdown in productivity growth.

The Australian rural sector comprises a diverse range of industries, owned and operated by a myriad of small family businesses. These structural characteristics of

the rural sector mean that the market failure in the provision of socially optimal levels of RD&E is likely to be more severe than in many other sectors of the economy, as the incentive for individual businesses to invest in R&D on their own is less. It is also difficult to apply property rights to the technology and knowledge from R&D in the rural sector. Government intervention through statutory levies overcomes this market failure and under-investment by providing industry with a means of collectively investing in R&D that will benefit the industry.

Other forms of public support and interventions for business R&D, such as the R&D tax concession and intellectual property rights, are not well suited to the rural sector, with its myriad of small producers. In 2007-08, 2 968 companies claimed the tax offset (less than 1.0 percent of companies), of which only 67 were from the agriculture, fisheries and forestry sector with total claims of $9 million (ATO, 2008).

Public funding for rural R&D also recognises the high level of spillovers that are of benefit to the broader economy and community. And, while there is ample empirical evidence of high returns and spillovers from investment in rural R&D and some spillovers beyond the rural sector can be quantified by conventional methods, other environmental and social spillovers on the community are not readily measurable.

The current levy and matching funding arrangements, through the RDC model, allows the government to encourage rural R&D to a similar extent it is encouraged elsewhere in the economy. As for other industries there is a case for some support to be directed at R&D that has direct industry benefits as well as R&D that has broader public benefits.

Around $500 million of the total annual spending on rural R&D in Australia is sourced from industry and the Australian Government through the rural RDCs. The RDC model has evolved so that today no two RDCs operate in exactly the same way. The majority of RDCs are now industry-owned companies that provide R&D, marketing and other services to their respective industries. The changes and variations between the RDCs reflect the different industries they serve and the changes to government policy over twenty years.

Changes among other players in the rural R&D system have also impacted the RDCs. Most notably, the state governments' R&D budgets have reduced as a proportion of overall rural R&D spending and their traditional role in extension has declined. Extension is now delivered through a wide range of pathways, in which the RDCs and private providers have become more prominent.

DAFF holds the view that broadly speaking the RDC model is still the most appropriate mechanism to increase investment in R&D to help Australian rural industries remain internationally competitive and sustainable. The key elements in the original broad RDC model continue to be its strengths:

- statutory levies and the industry/government matching funding partnership, with strong industry support
- the broad scope of rural research activities that may be funded by RDCs
- a rational and integrated approach to R&D priority setting with a strong focus on outcomes

- close involvement of industry throughout the process of priority setting and reporting, leading to strong uptake of R&D results
- independent boards that are charged with strong leadership and taking a strategic approach to rural R&D
- dual accountability to both industry and the Australian Parliament
- development of key linkages with other R&D funders and providers
- increasing focus on evaluation of R&D to understand better the returns on investment and guide future research investment.

The Australian RDC model is unique among international R&D funding models, and is praised by other countries in how it combines industry needs with public benefits, engages the rural sector in funding R&D, sets industry priorities and in generating ownership and uptake of research findings by industry. The model has demonstrated flexibility in being able to respond to increasing demand for R&D to deal with priorities associated with managing Australia's natural resources and the challenge of climate change.

The model and statutory levy system have proven to be successful with strong industry support, which has grown over twenty years. Evaluations of research by the RDCs show a high level of benefits to both the private and public sectors well in excess of the investment made.

Since the RDCs were established, their funding, influence and their stakeholders' expectations have grown significantly. The RDCs are the largest single source of rural R&D funding, and have taken a leading role in developing the National Primary Industries Research Development and Extension Framework.

This expanding influence raises expectations that the RDCs can fund a wider spectrum of research and address down stream and cross sectoral issues, contribute to infrastructure costs, widen their extension role and build science and industry capability. The funding the RDCs receive is being stretched to meet these expectations, but it is limited by industry growth, and willingness to pay. DAFF believes additional investment is required in the rural R&D system to adequately address the major challenges facing Australia, including the need to boost industry productivity. The RDCs have proven very successful in delivering R&D to the rural sector and are well placed to respond to new challenges.

Notwithstanding its strong support for the model, DAFF believes that there are further areas for improvement and modifications that should be made to improve R&D outcomes for industry and the Australian community. These include:

- continued strengthening of statutory funding agreements to improve the governance and accountability of the industry-owned RDCs and provide the government with greater power to give directions
- extending regular external performance reviews to all RDCs to improve transparency and accountability, and to provide performance benchmarks
- greater evaluation of research investments across RDCs, and utilisation of this analysis to inform decisions on future investments and project selection

- more efficient use of administrative resources across the RDCs to free up resources to deliver better R&D outcomes, including through shared administration, harmonisation of common processes to achieve best practice standards, shared accommodation and, potentially, amalgamation of RDCs
- exploring options to widen the contributions for rural R&D from other stakeholders in the rural sector and supply chain who benefit from the research outcomes
- increasing the level of collaboration and co-investment between the RDCs to deliver better research outcomes, particularly to deal with high priority cross sectoral issues or to address common issues facing all RDCs. There is already evidence of increasing collaboration among some RDCs, but this could be strengthened by the establishment and investment of pooled funds in priority R&D. The National Strategic Rural R&D Investment Plan currently being developed by the Rural R&D Council for the Australian Government's consideration will help guide efforts to increase collaboration and co-investment in high priority areas.

As the RDCs are an integral component of the rural RD&E system any substantial changes to the model are likely to have implications for the wider system and should be considered carefully.

Key points

- Investment in rural R&D is essential to maintain and improve productivity growth in Australia's agriculture, fisheries and forestry industries, and to address the main challenges for the sector. These range from continuing pressure on the terms of trade, competition for natural resources, mitigating and adapting to climate change, and attracting skilled people.
- Over many years and research projects, strong evidence has been collected that indicates high returns on rural R&D with extensive spillovers beyond the sector.
- DAFF holds the view that the RDC model is still strong, and is a valid partnership between government and industry to encourage investment in rural RD&E.
- With the imperative to strengthen productivity growth, and recognising the high spillovers in rural R&D, DAFF believes the dollar for dollar matching formula is still appropriate.
- The RDC model has worked well in engaging industry in R&D, increasing investment and influencing the wider rural R&D system. As a business model to encourage industry to invest in R&D and to achieve the government's objectives, the RDC model's strengths outweigh its weaknesses.
- The RDCs are stretching their limited funding to meet an expanding range of expectations which are driven by the changing rural R&D environment and system. DAFF believes additional investment is required in the rural R&D system to adequately address the major challenges facing Australia, noting that this is limited by industry growth and willingness to pay. The RDCs have limited capacity to meet growing expectations satisfactorily without some reform to free up resources.
- The RDC model has continued to evolve with changes made to strengthen and make it more responsive, transparent and accountable. Notwithstanding its strong support for the model, DAFF believes that there are further areas for improvement and modifications should be made to improve R&D outcomes for industry and the Australian community.
- The implications of substantial changes to the model should be carefully considered in the context of the wider rural R&D system.

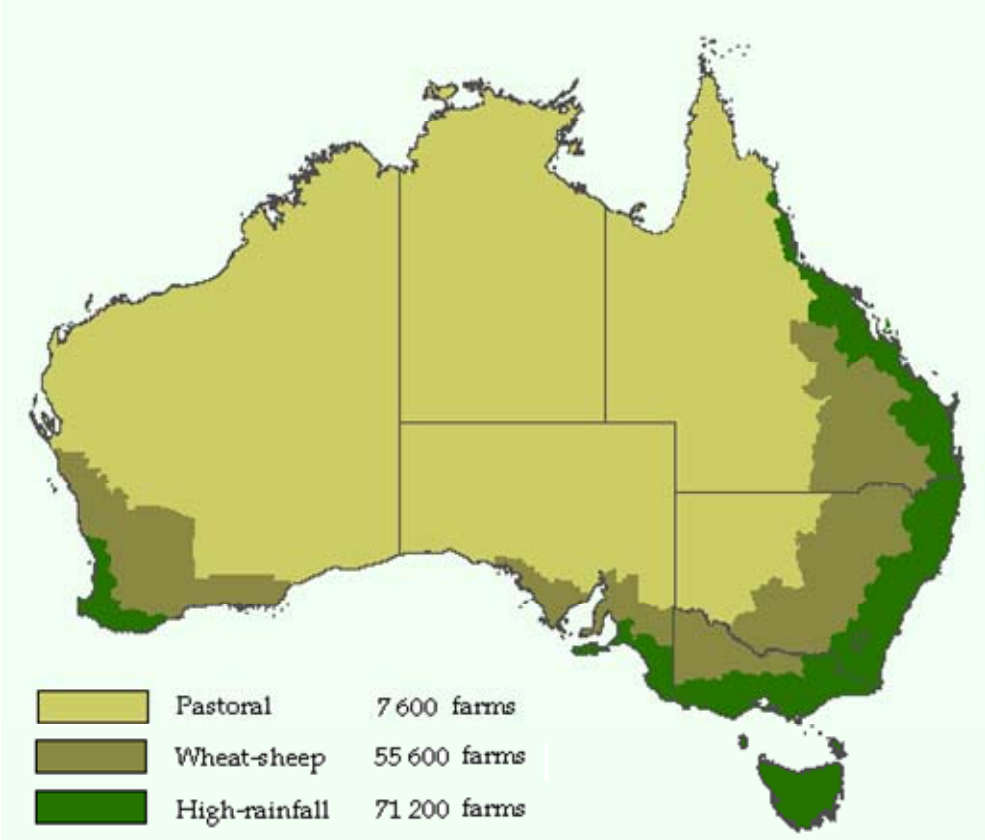
1. Agriculture, fisheries, forestry and food industry characteristics and their importance to Australia

Innovation and investment in research and development have been major factors in making the Australian agriculture, fisheries and forestry industries into what they are today. This stretches back to the state governments providing funding and providing research, development and extension to farmers predating Federation, and the forerunner of the Commonwealth Scientific and Industrial Research Organisation (CSIRO) which was initiated in 1926 to respond to agricultural issues.

While the rural sector contributes around three percent to the Australian economy, it is one of Australia's major exporters, bringing in around $30 billion each year. The new knowledge and technology that is generated through research and development and transferred to industry through extension is imperative in enabling rural industries to be internationally competitive, environmentally sustainable and socially responsible.

1.1 Characteristics

Agriculture occupies around 60 per cent of Australia's land mass. The type of agriculture pursued in a given area is a determined largely by climate, soil type and water availability. There are three broad classifications of land in which agricultural activity occurs, commonly referred to as the high-rainfall, wheat-sheep and pastoral zones. Figure 1.1 below shows the geographical distribution of these areas, as well as the number of farms in each in 2007. Within these areas there is also some irrigated farming, drawing on stored surface water (much of it from dams or major rivers and streams) and underground sources.



The shape of Australian agriculture has undergone significant change in the last two decades or so. There were around 134 000 farms operating in 2007, down around 22 per cent from 1985-86. The number of people working on farms has also declined significantly in recent times, dropping from 386 000 in 2001-02 to 303 000 in 2007-08. The impact of severe drought during this period has also played a part in the magnitude of the decline.

In the period between 1987–88 and 2007–08 the number of broadacre farms in Australia has fallen from around 80 000 farms to close to 61 000 farms. Over the same period the total land area operated by these enterprises fell by around 5 per cent. Strong demand for rural land during this period has resulted in a sharp increase in land values, raising the total capital value of farms. The average total capital value (in 2007–08 dollar terms) of broadacre farms has more than doubled over the 20 year time period to be $3.5 million in 2007–08.

Within Australian farming there is a wide diversity of industries and size range. As well as broadacre agriculture, intensive agricultural industries such as horticulture, dairy, poultry and pork are major industries. These are characterised by the high inputs of capital, labour, or heavy usage of technologies such as pesticides and chemical fertilisers relative to land area.

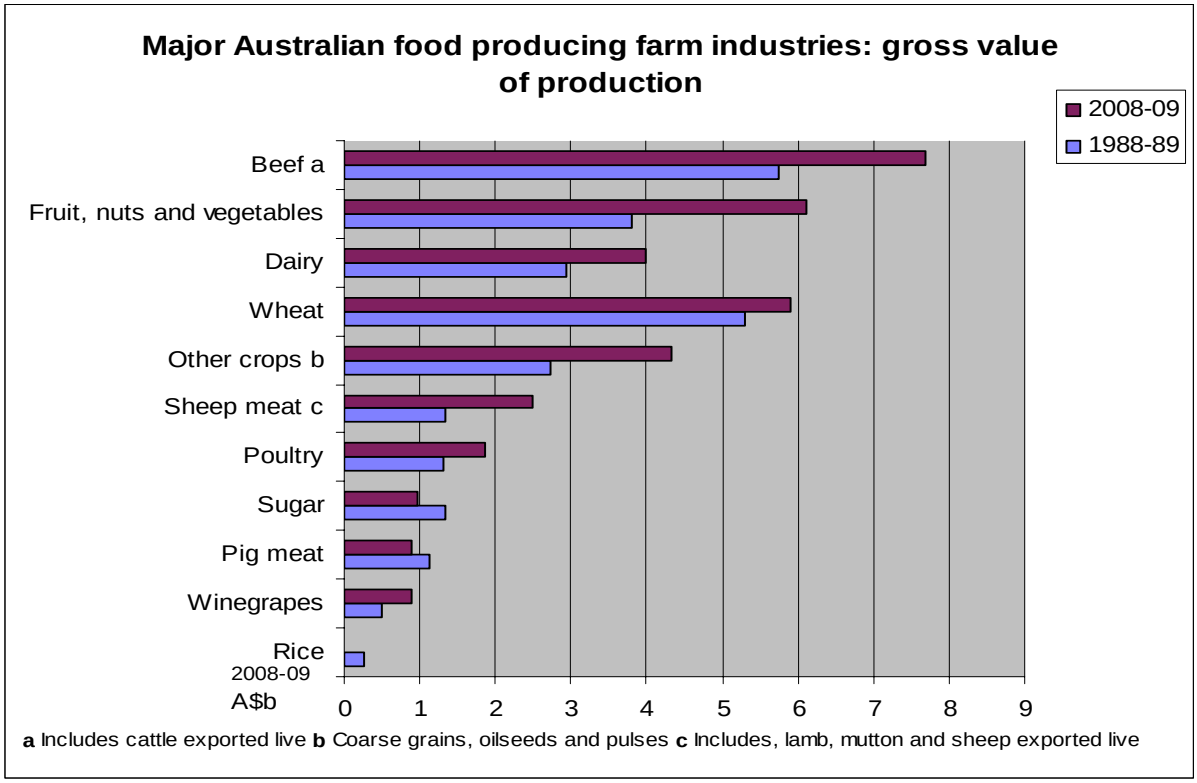
ABARE estimates that the gross value of horticulture in 2008-09 was around $7.9 billion. Sector shares are: vegetables 43%, fruit & nuts 34%, nursery (including turf & cut flowers) 20%, table grapes and dried fruit 3%. Horticulture production in Australia has grown and evolved significantly over the last ten years to meet the health, taste and lifestyle needs of the ever changing Australian consumer. Since 1999-2000 the gross value of production has increased by around 60 percent.

Fisheries and aquaculture is Australia's sixth most valuable food-based primary industry with a landed value of more than $2.1 billion a year. In addition, more than 3.4 million Australians recreationally fish each year spending an additional $2.5 billion. Although the volume of Australian fisheries production over the past decade has been relatively stable at around 250 000 tonnes, the composition of fisheries production has changed considerably. From 1998-99 to 2007-08, the volume of aquaculture production has almost doubled. In contrast, over the past several years there has been a declining trend in wild catch production, from 250 000 tonnes in 2003-04 to 178 000 tonnes in 2007-08. As a result, aquaculture's share of production grew from just over 16 per cent in 1999-2000 to just less than 26 per cent in 2007-08 (Mazur et al, 2010).

Forests cover approximately 149.4 million hectares or 19 per cent of Australia's land area, serving conservation, wood production and reserved areas for Indigenous communities. Of this, native forest accounts for 147.4 million hectares or 99 per cent of the total area, with a further 2.02 million hectares of forest plantations, including hardwood and softwood species.

A ranking of the major industries according to their gross values of production in real terms of 2007-08 is shown in Figure 1.2. The figure also illustrates how the relative magnitude of each industry has changed in the two decades since 1987-88.

Figure 1.2 Major Australian rural industries: gross value of production



Source: ABARE data.

1.2 Economic, social and environmental importance

(a) Importance to rural and regional communities

Agriculture is the foundation of many rural and regional communities. The economic activity that the agriculture and food industries bring to such communities in the form of employment, direct spending and indirect spending through service industries is critical to their survival and prosperity.

Across the Australian economy as a whole, the agricultural sector accounts for only around 2.9 per cent of total employment. However, the dependence on agriculture for jobs is significantly higher in regional and remote Australia than for the nation as a whole. At the time of the 2006 census, around 13.4 per cent of those employed in remote areas were engaged in agriculture and services to agriculture. The sector also accounted for 9.1 per cent of those employed in the rest of inland Australia in service and processing industries. For example, the production from farms feed into processing industries, including meat, dairy, seafood, fruit and vegetable processing, sugar, confectionary and beverage manufacturing, flour milling and baking, wool processing and paper and pulp manufacturing. In 2006-07 this part of the agriculture and food sector employed more than 191,000 people, with around half of the food processing firms and 40 per cent of employees being located in rural and regional areas. In 2007-08, employment in the food and beverage manufacturing sector increased by 7 percent relative to 2006-07.

(b) **Important nationally**

Australian land tenure is mostly under freehold title or some form of long term lease from the crown, with freehold being predominant in the more productive and closely settled regions. The agricultural sector also plays an important role in landscape stewardship in Australia. In recent times there has been a significantly increased awareness amongst producers that looking after the land and natural resources is an important part of ensuring it remains productive.

In terms of economic contribution, the rural sector represents a small but important part of the national economy. The contribution of the rural sector to gross domestic product (GDP) and the relative shares of the other sectors of the economy are fairly typical of a mature economy, with the services sector now accounting for around three quarters of output.

Although the Australian economy almost doubled in size in real terms (net of inflation) from the early 1980s to 2007-08, the value of farm output only rose by 9 percent. Not surprisingly, agriculture's share of GDP has declined — from around 3.8 percent in the early 1980s to 2 percent in 2007-08. This decline in relative importance also reflects growth in the services, mining and manufacturing sectors.

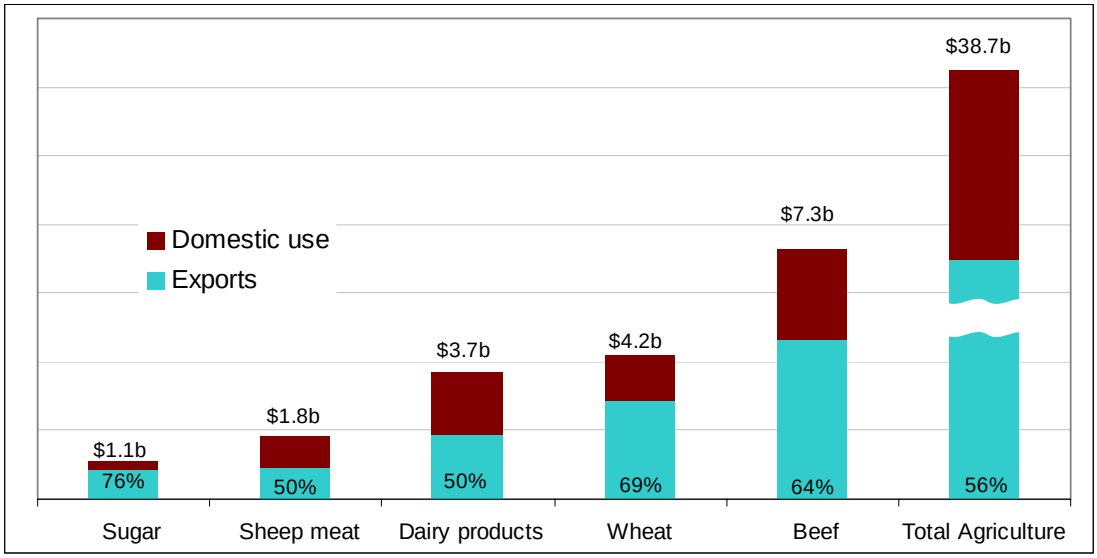
Although agriculture accounts for a relatively small proportion of national GDP, the recent drought demonstrated the importance of agriculture to overall economic performance in Australia. The 2006–07 drought is estimated to have reduced the rate of economic growth in Australia in 2006–07 by around 0.75 percentage points from what would otherwise have been achieved.

(c) **Important internationally**

Australian agriculture is strongly export oriented. In 2007–08, food exports were valued at $23.4 billion, accounting for approximately 13 per cent of Australia's total merchandise exports. Imports of food and food products in 2007–08 were valued at around $9 billion, nearly 40 per cent of the value exported.

The dependence of Australian farming on exports varies between industries. Over the period 2005–06 to 2007–08, around 56 per cent of the commodities produced on farms were exported (Figure 1.3). The average proportion of production exported during this period ranged from 76 per cent for sugar to 50 per cent for sheep meat and dairy products (principally in the form of manufactured products such as cheese, milk powders and butter).

Figure 1.3 Share of farm production exported (Average 2005-06 to 2007-2008)



Source: ABARE data.

Historically, Australia has been a net exporter of fisheries products in value terms but a net importer in volume terms as Australia mostly exports high value products. However, this has changed during the past 10 years as, in real terms, the value of Australian exports has declined by 42 per cent from 1999-2000 to 2008-09. The main reason for this was a decline in the volume of edible exports and falling unit prices for some major export species, particularly prawns, tuna and abalone.

The Australian forest industry has been experiencing a tough trading environment as a consequence of the global economic downturn and the strong Australian dollar adversely affecting international competitiveness of Australian products. Australian forest product exports reached $2.3 billion in 2008-09, down 5.2 per cent relative to the previous year.

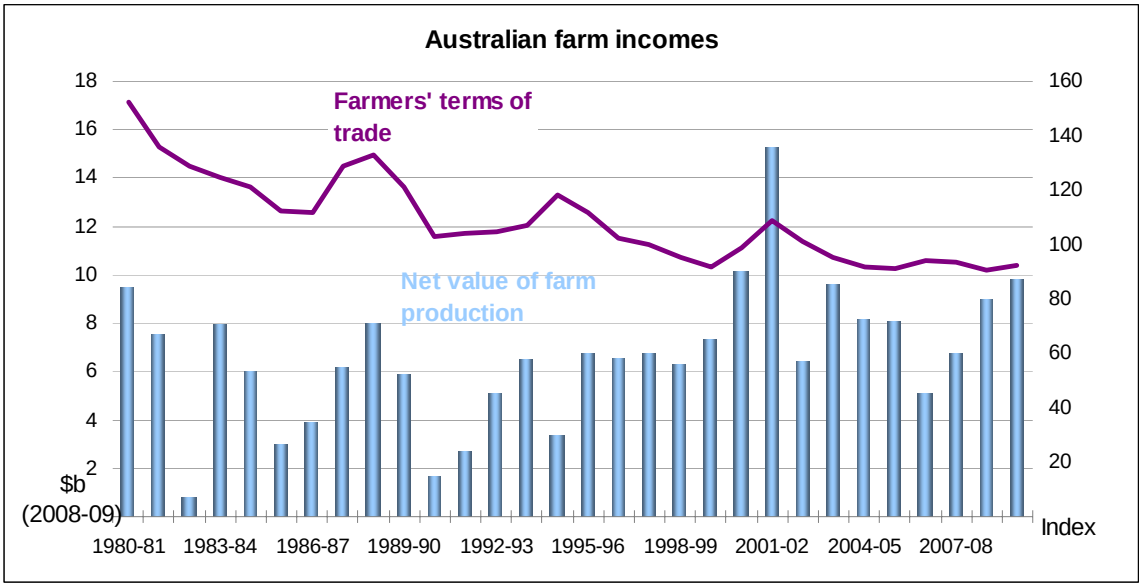
Internationally Australia is seen as an efficient producer of high quality worldclass products, and competitive in an often distorted marketplace. While our labour costs and input costs are relatively high, our agriculture, fisheries and forestry and food industries function without subsidisation and are underpinned by a strong culture of innovation.

1.3 Challenges facing the rural sector

(a) Terms of trade and international competition

The Australian agricultural sector has long faced a variety of challenges to increasing production and maintaining profitability. Declining terms of trade have been a consistent feature of the Australian farming landscape as prices for produce have grown more slowly than the cost of inputs. This has been the case on both the domestic market and internationally. As shown in Figure 1.4, terms of trade have declined more than 50 per cent between 1980-81 and 2007-08.

Figure 1.4 Australian farm incomes: terms of trade and net value of farm production

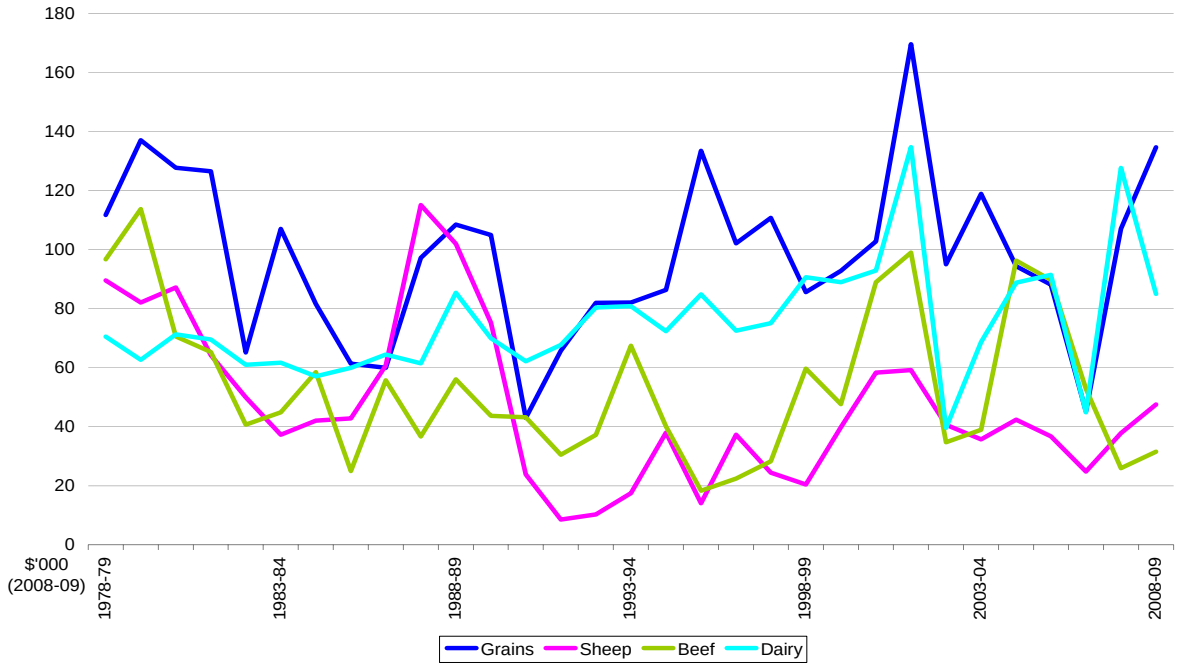


Source: ABARE data.

In recent times producers have also been hit hard by the drought, the impact of which peaked in 2006-07. Since then, increased global demand for many agricultural commodities and slight improvements in conditions have led to a rebound in the total value of production.

At the individual farm level, economic performance has been highly variable over an extended period across the major industries for which data are available. ABARE surveys of broadacre farms (grains, sheep and beef) and dairy farms highlight the disparity in performance between grains and livestock (sheep and beef) farm businesses since the collapse of the wool reserve price scheme in 1990–91. Consistently higher returns from cropping during the past decade have encouraged the movement of productive resources from sheep to grains production. Figure 1.5 illustrates the variability in farm cash incomes across broadacre industries and the dairy industry since 1978-79.

Figure 1.5 Average cash incomes of Australian broadacre and dairy farms



Source: ABARE data.

Coupled with this, productivity growth in broadacre agriculture has also slowed in recent times according to analysis by ABARE, with the impressive gains made by the cropping and mixed cropping livestock sectors now slowing. This is discussed further in Chapter 2.b and 2.c.

In recent times Australia's agricultural markets have also undergone change. As income throughout the world has increased, the demands of consumers have evolved. Increasingly affluent societies are consuming increased amount of protein, meaning an increased demand for Australian and global meat exports. In many cases Australian livestock is grain fed, increasing competition for grain between livestock feed and human consumption of grain. The growth in biofuel production in the USA, South America and Europe is also impacting on resource use, international commodity prices and food prices.

(b) Climate change and variability

Climate change poses challenges for all sectors of the Australian economy but particularly for those sectors dependent on natural resources, like agriculture, fisheries and forestry.

Australia's climate is changing and the impacts of climate change can be seen in the differences we are experiencing in increasing heat stress in animals and crops, decreasing water availability and increasing occurrences of pests and diseases. As a consequence, the agriculture, fisheries and forestry industry will need to adapt to maintain productivity growth and international competitiveness. Mitigation efforts will also be needed to reduce emissions and increase carbon sinks.

Potential changes in key climate variables in Australia are projected to result in a loss of agricultural productivity, declines in crop yields, pasture growth and livestock production and a rise in agricultural production costs, relative to what would otherwise be. Based on estimates of the potential impacts of climate change from a study by Cline (2007) that assume no carbon fertilisation and no adaptation or mitigation measures, Australian agricultural productivity is projected to be 17 per cent lower in 2050 than without climate change impacts.

ABARE's analysis shows that in the absence of climate change Australian agricultural output is projected to increase 100 per cent between 2006 and 2050. With this projected growth as a 'reference case', when the effects of climate change are taken into account Australian agricultural output is projected to increase by 77 per cent between 2006 and 2050, without any planned mitigation or adaptation measures (Gunasekera et al, 2007). At the commodity level, the growth in output of major commodities will also be less than in the reference case. By 2050, production of some key Australian agricultural commodities is projected to be between 13 and 19 percent below reference case levels (Table 1.1). Similarly, exports are expected to grow at a slower rate relative to the reference case as a result of climate change. By 2050 Australian exports of wheat and sugar are projected to be about 16 percent and 79 percent below reference case levels (Table 1.2). The significant reduction in sugar exports is projected to occur because of changes in international competitiveness resulting from relatively more severe climate change impacts in sugar-producing parts of Australia compared to other parts of the world, such as Brazil.

Table 1.1 Change in Australian agricultural <u>output</u> by commodity at 2050 as a result of climate change (assuming no planned mitigation or adaptation), relative to the reference case

	Australia	NSW	VIC	QLD	SA	WA	TAS	NT
% change								
Wheat	-13.3	-11.6	-13.4	-	-12.3	-13.4	-	-
Sheep	-14.2	-13.2	-12.9	-	-11.7	-13.2	-	-
Beef	-18.6	-3.0	-6.5	-33.5	-	-5.7		-33.2
Dairy	-18.2	-11.3	-10.0	-	-6.1	-	-12.5	-
Sugar	-14.5	-	-	-17.0	-	-	-	-

Source: ABARE data.

Table 1.2 Change in Australian agricultural <u>exports</u> by commodity at 2050 as a result of climate change (assuming no planned mitigation or adaptation), relative to the reference case

	Australia
% change	
Wheat	- 15
Sheep	- 21
Beef	- 33
Dairy	- 27
Sugar	- 79

Source: ABARE data.

Such modelling illustrates the extreme disruption climate change may cause Australian agricultural industries. Hence adaptation to changing conditions will be paramount to rural industries if they are to maintain their contribution to the national economy, especially in traded goods.

The mitigation of greenhouse gases is also a significant challenge for the Australian rural sector. The agriculture, fisheries and forestry sectors, including land use, land use change and forestry emissions, accounted for 20.9 percent of Australia's emissions in 2008 (Department of Climate Change and Energy Efficiency, 2010). Research and development has a major role to play in providing primary producers with the practices and technologies that will reduce emissions or increase sequestration. Research will position Australia's agriculture, fisheries and forestry sectors to produce food and fibre for a growing global population in a carbon constrained world. Research and development is also important to allow primary producers to effectively participate in carbon markets and other mechanisms that drive the mitigation of greenhouse gasses.

(c) **Global food security**

Food security exists when all people, at all times, have physical and economic access to enough safe and nutritious food to meet their dietary needs and food preferences for an active and healthy lifestyle (World Food Summit 1996).

The world's population is expected to increase from 6 billion today to 9 billion by 2050. To ensure sufficient food is supplied to meet this growing demand, the FAO estimates production will need to increase by 2 percent per year. This situation was highlighted dramatically with the rapid spike in global food prices in 2008 with food riots in some countries and exports stopped in others to build domestic supplies.

This was a result of a combination of demand and supply factors. Demand for food is increasing because of population growth and changing consumer tastes as incomes rise. Supply in recent years has failed to keep pace with demand growth because of adverse weather events and rising input costs, which contributed to a rundown in stocks, and resources being diverted to produce biofuels and animal feed.

While there is no immediate threat to our domestic food supply, Australia faces longer term food production capacity challenges, namely climate change, diminishing water supplies and soil degradation, agricultural labour shortages and a slowdown in agricultural productivity growth. Australia currently produces in excess of what it consumes and therefore contributes to the world's food needs. Australia can also contribute to international efforts to improve food security in a number of key areas, including contributing to and encouraging agricultural research and development to increase sustainable food production and providing technical expertise and capacity building.

In the past 50 years since the advent of the Green Revolution, gross world food production has risen from 1.84 billion tonnes, to 4.38 billion tonnes, an increase of 138 per cent (Austin, 2010). This is largely due to investment in research and development that has led to new technologies enabling higher crop yields.

As the global demand for food increases, combined with the pressures on food production, innovation and investment in R&D are seen as the key response. The World Bank's 2008 *World Development Report* focussed on agriculture for development, and explored, inter alia, the various instruments for using agriculture for

development, including policy reform markets, institutional innovation, and science and technology. The authors concluded that:

"Science and technological innovation are critical for the agriculture-for-development agenda to succeed on four fronts. First, at a global level, science will become even more important to meet growing demand in the face of rising resource constraints and energy costs. Second, in all countries, science and innovation are critical for maintaining market competitiveness, both domestic and global. Third, the potential of science to address poverty in both favoured and less favoured regions has yet to be fully tapped. Tailoring technologies to growing heterogeneity among farmers and to differentiated needs of men and women farmers remains a scientific and institutional challenge. And, fourth, science will be critical in adapting to and mitigating climate change and tackling environmental problems more generally." (Austin 2010)

(d) Skills and labour shortages

While Australian researchers and farmers have led the way in innovation, attracting skilled people to the sector is a major challenge in ensuring the continued growth and capability. This applies across the range of skills needed in rural industries from research scientists to the end-users of technology.

A range of factors are contributing to this situation including competition from other industries, poor promotion of the industry, an ageing population and a declining rural population. Impediments to meeting the industry's skills shortages include low levels of industry participation in education and training, low numbers of undergraduates and graduates in tertiary agriculture courses, poor awareness of agricultural career pathways and the limited capacity of the current education and training system to deliver innovative training solutions.

The agriculture sector is reported to have on average the oldest workforce, with the median age for workers in the industry being 48, and the some of the lowest rates of education and training of all the Australian industries, as traditionally practical experience has been valued above formal qualifications. Although formal qualifications are becoming more important in the industry, as at May 2007, 35.1 per cent of workers from the industry had an education attainment of Year 10 or below, compared with 13.1 per cent of all industries. More than 42.2 percent of workers in the agriculture industry had completed a non-school qualification, including 16.6 per cent with a Certificate III/IV qualification and 57.8 per cent of the workforce had no post school qualifications.

The sector's general attitude towards further education and training is changing slowly, and many agriculture businesses embrace the available training and research and development extension services, but the culture change needs to accelerate to attract skilled people to the industry.

2. Investment in rural R&D

2.1 Rationale for government involvement in rural R&D - Public good properties and risk

Research is subject to three broad sources of market failure: inappropriability, indivisibilities and uncertainty (Arrow 1962).

The most frequently cited argument for public intervention in rural research is the public good properties of research outputs. Much research is non-excludable, since with knowledge easily transferred and reproduced it is difficult to exclude anyone from acquiring it. Research may also be non-rival in consumption if one person has knowledge from a research project such knowledge can be made widely available at little or no cost.

The public good nature of research outputs means that those creating the output may not be able to recoup fully the social value of the research. It will not be possible to charge others who use the output and so 'free-riding' occurs. Since private returns will be less than social returns the result will be underinvestment in research.

The public good argument for public intervention in rural R&D is also sometimes called the 'spillover argument'. Non-excludability and non-rivalry mean that the benefits of research may spillover beyond the originators to others at no charge. Spillover benefits may occur from farms in a given industry to farms in the same industry, farms in other industries, non-farm sectors of the economy, other countries and the community in general.

While some spillovers beyond the rural sector can be quantified by conventional methods, some rural R&D projects also generate 'unmeasurable' effects on the rest of the economy. For example, the R&D aimed at achieving better water use efficiency has private benefits, but they also have substantial social benefits through their effects in the environment.

One option for correcting the market failure resulting from the public good nature of research output is to create enforceable property rights. This involves devices such as the patent system, copyright law and plant variety rights. If these measures are not satisfactory direct public investment in R&D is a further option.

The structural characteristics of the rural sector means the market failure in R&D is more severe than in many other sectors. Rural industries are mostly made up of a large number of small farms that each produce only a small fraction of industry output. If a property rights solution were applied in many cases it may be very costly to monitor for violations of patents and the like across large numbers of spatially dispersed farms. The costs may well exceed the benefits. In some cases property rights may be of limited use such as where it is possible to retain the seeds for farmers' use from an improved variety.

The relatively small scale of farms means that for some R&D the required level of funding may be beyond the capacity of any farm. Such indivisibilities favour cooperative funding by all farms that may benefit from the R&D. Indivisibilities in the scale of R&D do not mean that there will necessarily be underinvestment in R&D given that cooperative funding occurs as noted in a Productivity Commission report

(2007). Indivisibilities do not necessarily create a case for additional government funding. Nevertheless, indivisibilities are a potential source of market failure with a monopoly R&D provider being the natural outcome. A privately owned monopoly may constrain R&D output relative to the competitive ideal to maximise profits.

The relatively small scale of the Australian market for rural R&D, coupled with indivisibilities in the use of R&D, may also be a source of difficulty. In some areas conditions in Australian agriculture differ from those in the USA and EU which are larger markets for R&D. Information is an indivisible commodity, and the potential return from creating a piece of new information will be grow according to the number of possible applications. Thus, the expected return from one dollar of R&D will be greatest in the largest market. Firms undertaking global rural R&D will compete for returns from the largest markets neglecting a relatively small market like Australia if conditions differ from those in the USA and EU. This problem does not arise in some other sectors (or some segments of agriculture) where conditions in Australia and overseas markets are identical. This type of argument has been used to explain partially why drug companies prefer developing drugs for markets in developed rather than developing countries. If there are diminishing returns in R&D, competition should drive returns in the larger market down toward those in the smaller market but there may not be diminishing returns.

Another source of market failure in R&D is uncertainty. The uncertainty and risk associated with research outcomes may result in lower private investment in R&D than is socially desirable as instruments for shifting risk are imperfect and limited. In addition, the long term focus of many R&D activities means that the benefits from R&D expenditure may not be obtained for many years, therefore there may not be sufficient incentive for private investment in these R&D activities.

This rationale as it applies to the rural research and development corporations is discussed further in Chapter 4.5 and 5.2.

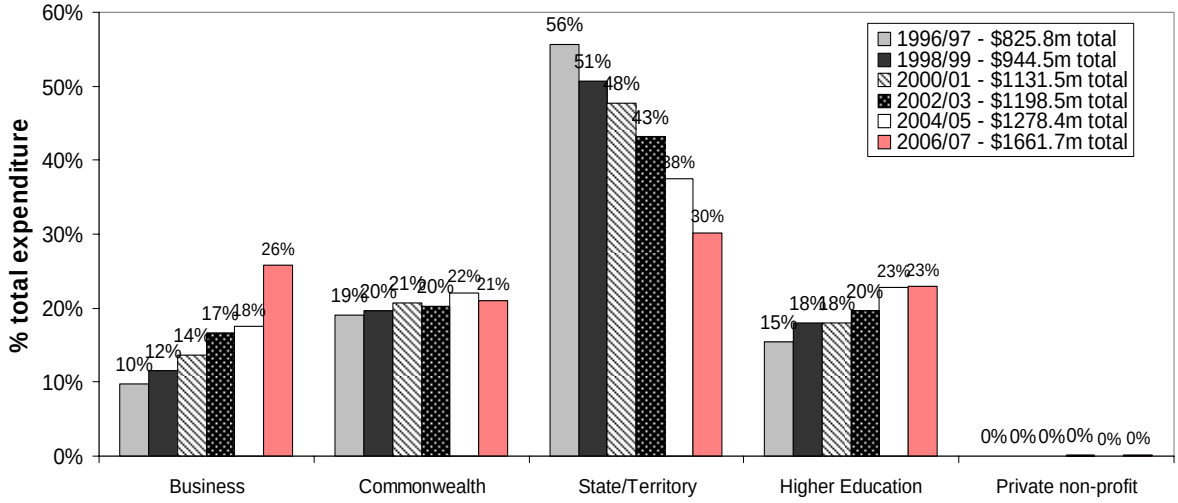
2.2 Impact of rural R&D investment in Australia

(a) Rural R&D expenditure

Australia has a long history of investing in rural research and development (Core, 2009; Williams and Evans, 1989) to improve productivity in agriculture, fisheries and forestry industries. There continue to be improvements made to crop varieties, livestock breeds, soil and water management practices, pasture types and precision agriculture technologies. In addition, farm managers have a greater set of tools for record keeping and decision-making, particularly since the introduction of advanced information communication technologies (ICT). Environmental and market pressures have also provided a strong incentive to improve productivity as farm managers seek to overcome climate variability, land degradation, water restrictions and price fluctuations to maintain viability and competitiveness.

The ABS estimates total expenditure on rural R&D in 2006-07 was $1.66 billion (ABS, 8112.0, 2006-07).

Figure 2.1 Rural R&D expenditure, by sector



Source: ABS, Research and Experimental Development, All Sector Summary

While total expenditure on agricultural R&D has doubled from 1996-97 to 2006-07, the share of government expenditure in total R&D expenditure has fallen (Figure 2.1). Public expenditure on R&D in Australian agriculture increased from $140 million in 1953 to $829 million in 2007 (in 2008 dollars) (Figure 2.2). Between 1953 and 1980, the growth in research investment averaged 6.5 percent a year, compared with 0.6 per cent a year since 1980. As a share of agricultural gross domestic product, investment peaked at 5 percent in the late 1970s, but has progressively fallen to slightly more than three percent in 2007. This reflects a decline in state government investment. The share of state agencies in national rural R&D funding has declined, from 52 percent in 1996-97 to 37 percent in 2006-07 (Sheng, Mullen and Zhao 2010).

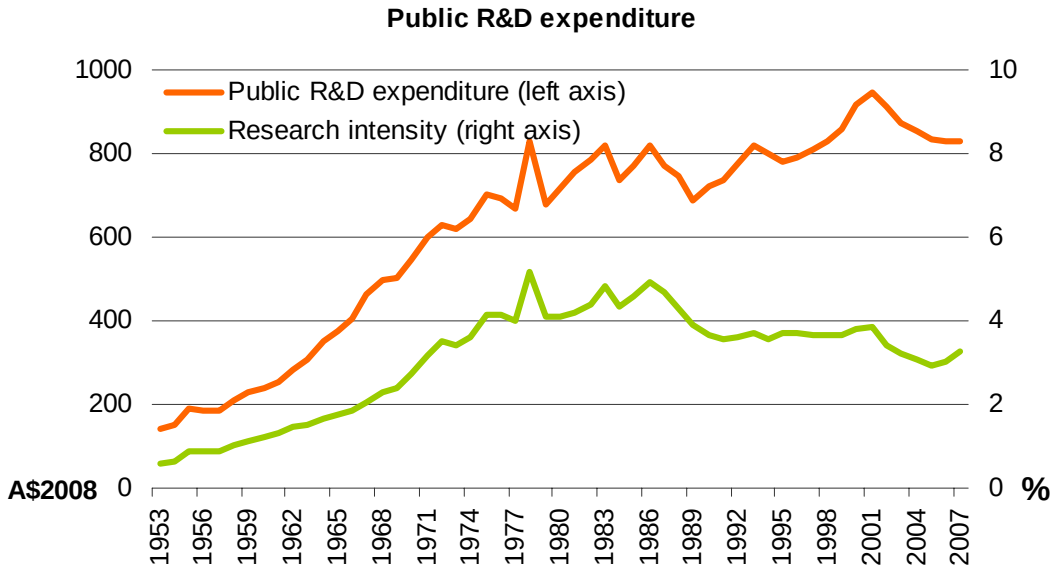


Figure 2.2 Source: Sheng, Mullen and Zhao 2010

As an investment source, the rural RDCs provided for around 28 percent of total R&D expenditure in the agriculture sector. In 2008-09, the total R&D investment by the rural research and development corporations was approximately $470 million, funded largely through industry levies of $244 million and government co-contributions of $218 million.

(b) R&D and productivity growth

The government's objective of lifting productivity across Australian industries through innovation is particularly pertinent to agriculture. Over recent decades, productivity growth in agriculture has been high and compares well against other industries, with investment in R&D supporting this growth.

Productivity growth occurs when producers become more efficient in converting inputs into outputs. There are three main ways in which greater efficiency may be achieved: using less inputs overall, using a different combination of inputs, or producing a different mix of outputs. These changes can be achieved through new technologies and knowledge, increasing adoption of current technologies, or exiting of less efficient producers.

Productivity growth is influenced by a range of factors, including R&D. Some factors that drive productivity growth can be influenced at the farm level, such as managerial abilities, human capital, economies of scale, and financial capability. However, there are also factors that are external to producers, such as market conditions, environmental conditions, policy setting and public infrastructure.

The effect of R&D expenditure can be difficult to measure because of the long lags between investment in research and productivity gains. In agriculture these lags can be up to several decades (Mullen 2007). Nevertheless, research in Australia and globally has invariably indicated that investment in agricultural R&D has been a strong driver of productivity growth.

Although agricultural productivity growth fluctuates from year to year, the long run trend has been of relatively high growth compared to other industries, at 2.2 percent a year over the past 30 years (agriculture, forestry and fishing combined). Productivity growth has been around 1.2 percent in manufacturing, 0.9 percent in retail trade and 0.8 percent in wholesale trade. However, while agricultural productivity growth was strong in the 1990s, since 2000 productivity growth has slowed.

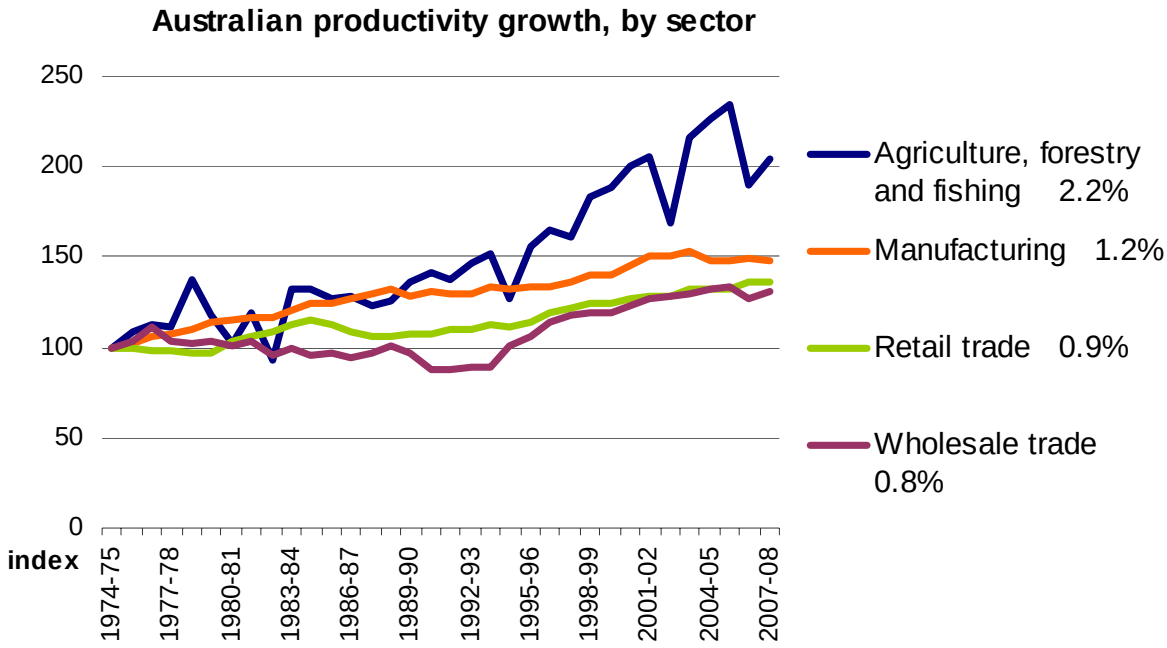


Figure 2.2 Source: ABARE Data.

ABARE estimates productivity growth in the broadacre industries has averaged 1.4 per cent a year between 1977-78 and 2007-08. The gain reflects a long-term decline in input use, averaging 0.6 per cent a year, coupled with an increase in output averaging 0.8 per cent a year, albeit with notable year to year fluctuations (Nossal and Sheng, 2010).

Agricultural productivity trends vary by industry. While the beef and sheep industries have experienced higher productivity growth in the past decade than in the two previous decades, the cropping and mixed crop-livestock industries have experienced a slowdown in long term productivity growth, largely as a result of a decline in rainfall.

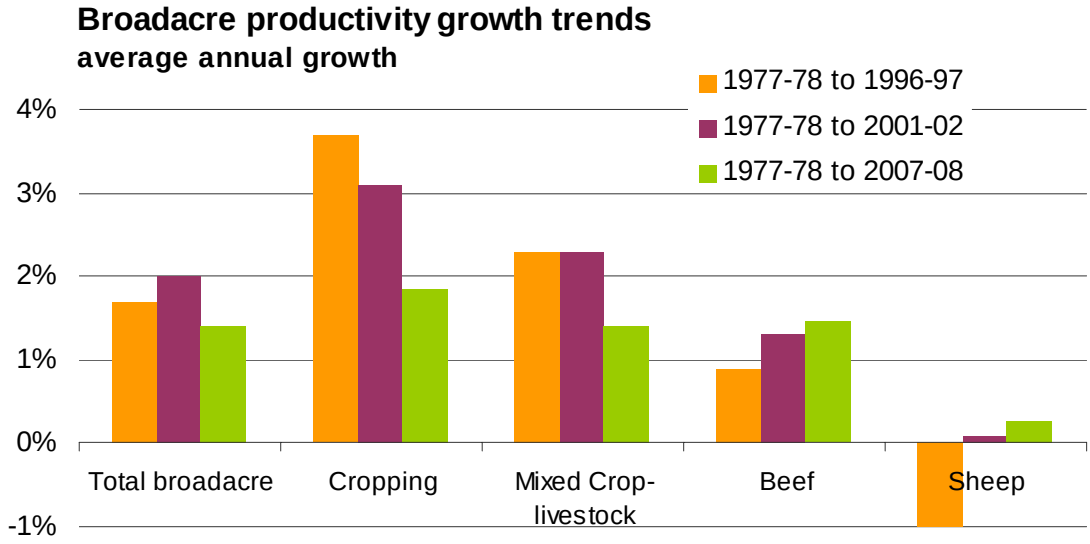


Figure 2.3 Source: ABARE (2010)

However, ABARE analysis has found that the slowdown in productivity growth cannot be explained by drought conditions alone. The decline in public R&D investment has been found to have also contributed to the slowdown in productivity growth (Sheng et al 2010).

(c) **Drivers of historical productivity growth**

These changing patterns have prompted ABARE to examine more closely the drivers of productivity growth in Australian broadacre agriculture over the past 50 years. ABARE's estimates of the effect of public R&D expenditure on the productivity of the broadacre industry show that public R&D investment has mainly had a long term impact on productivity growth (Sheng 2010, forthcoming). This reflects the long lags between R&D expenditure and innovation achievements, but it may also reflect a long term focus of R&D activities and underinvestment in technology adoption and extension activities.

In decomposing the drivers of agricultural productivity growth, ABARE's research in broadacre agriculture indicates that past growth in productivity is a result of technological progress reflecting what the most efficient farms can achieve, rather than efficiency improvements for the average farm (Hughes et al. 2010, forthcoming). Agricultural R&D activities play an important role in the development of new technologies and practices that drive technological progress. Thus, the estimated effect of technological progress on productivity growth reflects the impact of R&D activities.

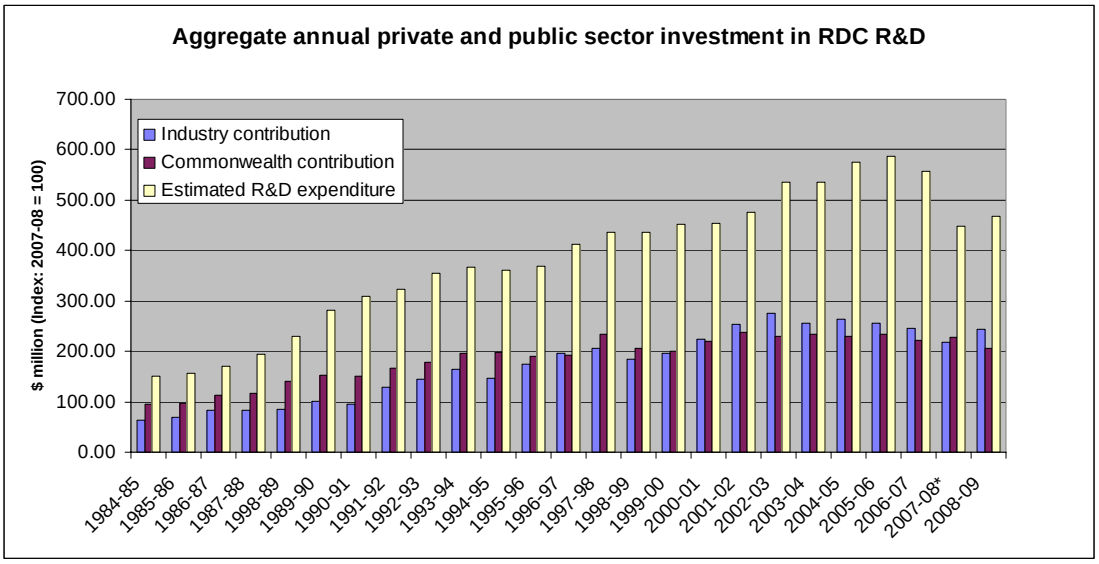
Productivity growth that is a result of efficiency improvements, rather than technological progress, reflects the average farms catching up to the most efficient farms. Efficiency improvements are usually driven by knowledge diffusion and technology adoption by farms. The rate of adoption of existing technologies is often considered to be influenced by extension services that bring new knowledge to farmers' attention and farmers' human capital characteristics (age, education, social networks, etc). In a farm level analysis of the relationship between productivity growth in broadacre agriculture and a range of human capital characteristics ABARE found that a number of these characteristics had an effect on productivity growth, in particular, farmer education level had a highly positive effect on productivity growth (Zhao et. al. 2009).

These empirical studies indicate that there may have been underinvestment in adoption and education activities historically. The public good properties of information and knowledge restrict private investment in education and adoption activities. Thus, there may be a role for increased government provision of education and training programs. While public investment in R&D has increased the long term growth in agricultural productivity, increased government expenditure on agricultural education and training programs could have a more rapid impact on productivity improvements.

3. How the rural innovation system works and the rural R&D corporations

3.1 Rural R&D in Australia and the position of the RDCs

Of the estimated $1.66 billion spent in 2006-07 by business, the Commonwealth and state and territory governments, higher education and private non-private organisations on agricultural, veterinary and environmental R&D, around $500 million was sourced from industry and the Commonwealth government through the RDCs.



(Source: Data on the R&D spending of the RDCs is sourced from their annual reports. In the case of industry owned companies, corporate costs are apportioned between R&D and marketing functions. In the case of statutory RDCs, R&D spending is taken as all expenditure. These figures are cross checked with those from the DAFF Levies Revenue Service.)

Since the RDCs were established in 1989, industry contributions through levies and voluntary contributions have grown from around $100 million to over $200 million (real dollars). As discussed in Chapter 2 (and illustrated in Figure 2.1) there has been an increase in total rural R&D spending from 1996-97 to 2006-07, from $825 million to $1.6 billion. However, the proportions of spending show a significant shift downwards in spending by state governments, from 56 per cent of the total in 1996-97 to 30 percent in 2006-07. This decline has largely been covered by increases from business (up from 10 percent to 26 per cent over the decade) and higher education (up from 15 percent to 23 percent). Commonwealth spending underwent a moderate percentage increase, from 19 percent in 1996-97 to 21 percent in 2006-07.

To understand these trends and the influence of the RDCs fully, the investment patterns need to be better analysed including finer details on where funds are invested and in what areas of research. However data at this level are not readily available.

3.2 The evolution of the RDC model and its features

The RDC model was introduced in 1989 under *the Primary Industries and Energy Research and Development Act 1989* (PIERD Act), to invest in and facilitate R&D in the agriculture, fisheries and forestry industries (the original model also included an energy RDC).

The model was intended to provide best value for money for the government, industry and the broader community in pursuing the objectives of:

- increasing economic, environmental and social benefits
- achieving sustainable use and management of natural resources
- making more effective use of human resources and skills
- improving accountability of expenditure.

The model has evolved, so that now there are 15 RDCs with varying characteristics.

Table 3.1 below highlights and summarises the common features and the variations between the 15 RDCs, in terms of function, legislation and governance, accountability to stakeholders, and funding.

Notwithstanding the variations between the RDCs, the key elements of the broad model are:

- the broad scope of rural research activities that may be funded by RDCs. The definition under the PIERD Act allows for scientific, technological or economic R&D across the production and supply chain. This extends across the R&D spectrum from basic and strategic research to applied research and development. As the RDCs have matured and the body of research findings has grown, the RDCs have expanded their role in extension to fill gaps left by the decline in traditional extension services and ensure the research they have invested in reaches the target market.
- a rational and integrated approach to R&D priority setting with a strong focus on outcomes. All RDCs are required to have medium term strategic plans and annual operating plans that are developed in consultation with industry, government and other stakeholders. Through this consultation, issues and needs are identified, given priority with appropriate research, development or extension activities and funding, according to the likelihood of achieving desired outcomes.
- close involvement of industry throughout the whole process of priority setting and reporting. Industry is able to participate in advisory groups, special events and R&D related activities, and annual meetings of the IOCs, as well as through their industry representative organisations. The RDCs have websites, produce regular newsletters and host conferences, support grower groups and industry activities, to which industry has access and through which it can provide feedback.
- independent boards that are charged with strong leadership and taking a strategic approach to rural R&D. Under the PIERD Act boards are required to have skills in commodity production, processing and marketing; conservation and management of natural resources; science, technology and technological transfer; environmental and ecological matters; economics; administration of R&D; finance and business management; sociology; public administration. IOCs boards are expected to comprise a similar mix of skills.
- dual accountability to both industry and the Parliament. The statutory RDCs report directly to the minister and parliament, and their gazetted industry

representative bodies under the requirements of the PIERD Act. The IOCs are also accountable to the minister and Parliament for the expenditure of levies and government matching through their funding agreements with the government. They are accountable to their industry members through the *Corporations Act 2001*.

Nine of the RDCs are now private industry-owned companies. This evolution towards private companies has stemmed from the industries perceived need for a collective industry marketing and promotion effort; the synergies between understanding and meeting market needs and R&D.

Table 3.1 Statutory Research and Development Corporations

RDC and representative organisations	Function and levy	Legal framework	Funding	Formal accountability to stakeholders
Rural Industries RDC - National Farmers' Federation - Australian Chicken meat Federation	Function: research Levy: Refer to Appendix A and B	Primary Industries and Energy Research and Development Act 1989 & Commonwealth Authorities and Companies Act 1997	**2008-09** ▪ Appropriation: $13.808m (61% of total income.) Note: RIRDC's appropriation was cut by $3m in 2009-10 ▪ Industry levies: $1.728 (8%) ▪ Commonwealth matching funds: $2.542 (11%) ▪ Voluntary industry contributions: $2.144 (9%)	▪ Primary Industries and Energy Research and Development Act 1989: ▪ Minister - Board appointed by minister (s.17) ▪ Annual report tabled in parliament (s.28) ▪ Strategic plan and annual operating plan approved by minister (s.19-27) ▪ Minister can issue directions as to the performance of an RDC's functions and exercise of its powers (s.143) ▪ RDC must present annual report to representative organisation at an annual conference or meeting of the organisation's executive (s.29) and strategic and annual operating plans (s.19-27). ▪ Representative organisations nominate people to the selection committee for appointment by the minister (s.124)
Cotton RDC - Cotton Australia (declared 17 March 2009)			**2008-09** ▪ Industry levies: $2.374m (32% of total income) ▪ Commonwealth matching funds: $2.436 m (31%) ▪ Royalties $1.61m (21%)	
Sugar RDC - Australian Cane Farmers Association Ltd - Australian Canegrowers Council Ltd - Australia Sugar Milling Council Ltd			**2008-09** ▪ Industry levies: $4.317 m (39% of total income) ▪ Commonwealth matching funds: $5.110 m (46%)	
Grains RDC - Grains Council of Australia			**2008-09** ▪ Industry levies: $89.207 m (59% of total income) ▪ Commonwealth matching funds: $43.896 m (29%)	
Grape and Wine RDC - Winemakers Federation of Australia - Wine Grape Growers Australia			**2008-09** ▪ Industry levies: $13.331m (52% of total income) ▪ Commonwealth matching funds: $11.703m (45%)	
Fisheries RDC - National Aquaculture Council - Recfish Australia - Commonwealth Fisheries Association			▪ Commonwealth provides unmatched funds equivalent to 0.5 percent of GVP, plus matching of industry contribution up to 0.25 percent of GVP ▪ Industry contributions collected by AFMA and state and territory governments **2008-09** ▪ Industry contribution: $9.519m (33% of total income) ▪ Commonwealth unmatched contribution: $10.996m (38%) ▪ Matching funds: $5.303m (18%)	

Industry-owned companies

Australian Wool Innovation Established 2003 (combined a statutory body investing in R&D only with marketing body)	**Function**	Research and marketing
	Levy	Refer to Appendix A and B
	Legal framework	Corporations Act 2001 Wool Services Privatisation Act 2000 Funding agreement 1 July 2010 – 30 June 2014
	Funding	▪ Statutory industry levy + government matching of R&D expenditure **2008-09:** ▪ Wool levy revenue - $34.307m (56% of total income) ▪ Government matching on R&D expenditure: $11.395m (18%)
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Parliament/minister – funding agreement ▪ Performance review required every three years ▪ Board is elected by members ▪ WoolPoll held every three years to decide levy rates and key investment areas
Australian Pork Limited Established 2001 (previously a statutory RDC)	**Function**	Research, marketing and industry strategic policy (including industry representation)
	Levy	Refer to Appendix A and B
	Legal framework	Corporations Act 2001 Pig Industry Act 2001 Funding agreement – 2001 (no sunset clause - new agreement being drafted)
	Funding	▪ Statutory marketing and R&D levies + government matching of R&D expenditure **2008-09:** ▪ Total industry levies and contributions: $11.692m (79% of total income) ▪ Commonwealth matching on R&D expenditure: $2.759m (19%)
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Parliament/minister – funding agreement ▪ Performance review required every three years ▪ Board elected by members
Australian Egg Corporation Limited Established 2003 (previously a part of RIRDC)	**Function**	Research and marketing
	Levy	Refer to Appendix A and B
	Legal framework	Corporations Act 2001 Egg Industry Service Provision Act 2002
	Funding	▪ Statutory marketing and R&D levies + government matching of R&D expenditure **2008-09:** ▪ Total industry levies and contributions: $3.799m (77% of total income) ▪ Commonwealth matching on R&D expenditure: $0.909m (18%)
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Parliament/minister – funding agreement ▪ Performance review required every three years ▪ Board elected by members

Industry-owned companies (continued)

Dairy Australia Established 1 June 2001 (previously a statutory RDC)	**Function**	Research, marketing and strategic policy development
	Levy	Refer to Appendix A and B
	Legal framework	Corporations Act 2001 Dairy Produce Act 1986 Funding agreement – six months after the next dairy poll
	Funding	▪ Industry levy (no split between R&D and marketing) + government matching of R&D expenditure **2008-09:** ▪ Total industry levies and contributions: $29.450m (55% of total income) ▪ Commonwealth matching on R&D expenditure: $19.167m (36%)
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Parliament/minister – funding agreement ▪ Performance review required before the next dairy poll ▪ Board elected by members ▪ Dairy Poll required at least every five years to decide levy rates and key investment areas ▪ Annual Report and Compliance Report tabled in Parliament by the minister
Forest and Wood Products Australia Established 3 September 2007 (previously a statutory RDC)	**Function**	Research, marketing and industry strategic policy
	Levy	Refer to Appendix A and B
	Legal framework	Corporations Act 2001 Forestry Marketing and Research and Development Services Act 2007 Funding agreement 3 September 2007 – 30 June 2012
	Funding	▪ Industry levy (no split between R&D and marketing) + government matching of R&D expenditure **2008-09:** ▪ Total industry levies and contributions: $5.058m (53% of total income) ▪ Commonwealth matching on R&D expenditure: $3.729m (39%)
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Parliament/minister – funding agreement ▪ Performance review required before the expiry of the next funding agreement ▪ Board elected by members
Horticulture Australia Limited established in 2000 – from a merger of Horticulture R&D Corporation and Horticulture Marketing Australia	**Function**	Research and marketing
	Levy	Refer to Appendix A and B
	Legal framework	Corporations Act 2001 Horticulture Marketing and Research and Development Services Act 2000 Funding agreement 2000 – no sunset clause (new agreement being drafted)
	Funding	▪ Marketing and R&D levies and voluntary contributions + government matching of R&D expenditure **2008-09:** ▪ Marketing levies: $15.120m (15%) ▪ R&D statutory levies: $20.350m (21%) ▪ R&D voluntary contributions: $20.559m (21%) ▪ Commonwealth matching: $39.803m (40%)
	Formal accountability to stakeholders	▪ Members (44 industry representative bodies) – AGM and annual report ▪ Parliament/minister – funding agreement ▪ Performance review required every three years ▪ Board elected by members (who are peak industry bodies)

Industry-owned companies (continued)

Meat and Livestock Australia Established 1998	**Function**	Research and marketing
	Levy	Refer to Appendix A and B * Commonwealth matches R&D funds spent by MLA contributions from MLA Donor Company, LiveCorp and AMPC under the donor company arrangements
	Legal framework	Corporations Act 2001 *Australian Meat and Livestock Industry Act 1997* Funding agreement 13 April 2007- 31 December 2010. MLA Donor Company Deed
	Funding	▪ Marketing and R&D levies and voluntary contributions + government matching of R&D expenditure **2008-09:** ▪ Marketing & R&D statutory levies: $98.068m (60%) ▪ Other income of $30.935m (19%) inc. contributions from AMPC ($10.554m), LiveCorp ($1.963m) and R&D partnership income ($8.279m).* ▪ Commonwealth matching: $31.443m (19%)*
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Minister – funding agreement ▪ Board elected by members
Australian Livestock Exporters Corporation Limited (LiveCorp) Established 1998	**Function**	Research and marketing
	Levy	Refer to Appendix A and B * Commonwealth matches R&D funds spent by MLA contributions from MLA Donor Company, LiveCorp and AMPC under the donor company arrangements
	Legal framework	Corporations Act 2001 *Australian Meat and Livestock Industry Act 1997* Funding agreement: 1 July 2010- 30 June 2013. Donor Company Deed 1998
	Funding	▪ Marketing and R&D levies and voluntary contributions **2008-09:** ▪ Marketing levies: $4.277 (82%) ▪ R&D statutory levies: $0.833m (16%) ▪ Voluntary dairy live export contributions: $0.063m (1%) ▪ Commonwealth matching: $0 (0%)*
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Minister – funding agreement ▪ Performance review required every three years ▪ Board elected by members ▪ Funding agreement, annual report and compliance report tabled in Parliament by the minister
Australian Meat Processor Corporation Established 1998	**Function**	Research and marketing
	Levy	Refer to Appendix A and B * Commonwealth matches R&D funds spent by MLA contributions from MLA Donor Company, LiveCorp and AMPC under the donor company arrangements
	Legal framework	Corporations Act 2001 *Australian Meat and Livestock Industry Act 1997* Funding agreement: 1 September 2007 – 1 December 2010 Donor Company Deed 1998
	Funding	▪ Marketing and R&D levies and voluntary contributions **2008-09:** ▪ Marketing & R&D statutory levies: $17.863m (91%) ▪ Commonwealth matching: $0 (0%)*
	Formal accountability to stakeholders	▪ Members (individual members) – AGM and annual report ▪ Minister – funding agreement ▪ Performance review required every three years ▪ Board elected by members

3.3 Funding of RDCs

Co-investment in research in primary industries, through matching funding up to 0.5 percent of gross value of production (GVP), predates the current RDC model. In establishing the current model in 1989, the co-investment arrangement was re-affirmed and provided as an industry incentive, with the expectation that the level of rural research would increase substantially through levy increases and new levies. Total spending of one percent of GVP was regarded as a minimum R&D investment for most industries, and

> '*By the time this minimum is reached, however, industry should itself determine whether increased funding is warranted. If it is, industry should fund it.'* (Kerin and Cook, 1989).

Today, the RDCs continue to be funded by levies raised from producer members matched with government contributions for eligible R&D of up to 0.5 percent of each industry's GVP. Over twenty years the level of industry investment has expanded substantially as expected, with some industries choosing to contribute more to R&D beyond the 0.5 percent GVP cap. Table 3.2 below indicates the industry levy contributions in relation to the 0.5 percent GVP cap, total R&D expenditure by the RDCs and the government's 50 percent matching contribution on expenditure in 2008-09.

The grains and wool industry have set their R&D levies well above the 0.5 percent GVP cap for many years, and so its total R&D expenditure exceeds that portion that attracts government matching funding.

The dairy and wool industries have a single marketing and R&D levy which exceeds the 0.5 percent GVP cap. Those industries close to the GVP cap are cotton, grape and wine, sugar and horticulture, but meat and livestock, forest and wood products and eggs are below the cap.

Table 3.2 – Industry R&D levies, gross value of production and R&D expenditure caps 2008-09

R&D Corporation	Industry Contribution for 08-09 (levy receipt excluded penalties except for Dairy and Forestry during 08-09)	Total R&D Expenditure declared by Corp for 08-09 Clth Matching	50% of declared R&D expenditure are eligible for Clth Matching (one of the criteria for Clth Matching)	Annual limit at 0.5% of 08-09 determined GVP (one of the criteria for Clth Matching)	Note
Sugar	4,552,146.05	10,276,914.00	5,138,457.00	5,110,474.92	
Grains	89,206,891.45	109,361,209.44	54,680,604.72	43,896,588.44	
Pork	3,098,513.83	5,519,676.32	2,759,838.16	5,142,166.67	
Cotton	2,383,459.12	7,797,230.00	3,898,615.00	2,435,794.33	
Dairy	31,931,560.94	33,683,017.38	16,841,508.69	19,167,360.49	
Grapes/Wine	13,243,573.18	23,406,535.16	11,703,267.58	14,774,953.65	
Meat & Livestock	37,639,652.76	62,886,953.77	31,443,476.89	52,842,185.40	
Wool	34,293,936.54	35,369,777.69	17,684,888.85	11,395,452.62	
Forest & Wood	4,907,593.25	7,458,504.93	3,729,252.47	8,886,666.67	
Fisheries	5,457,450.24	27,751,984.00	n/a	10,996,375.00	
Egg	909,985.58	1,867,654.56	933,827.28	2,189,333.34	
Rural Industries					
Buffalo	20,226.19	47,323.59	23,661.80	19,796.67	*PIERD Act 1989 S30A Levy receipts are not one of the criteria for Clth Matching payable to RIRDC*
Deer	50,621.81	115,979.83	57,989.92	13,516.67	
Chicken Meat	1,109,053.23	3,302,383.78	1,651,191.89	7,768,000.00	
Goat Fibre	20,683.81	81,665.00	40,832.50	11,015.00	
Honey	245,443.23	659,047.25	329,523.63	366,862.91	
Kangaroo	77,917.90	303,944.58	151,972.29	204,915.00	
Pasture Seeds	146,586.37	406,222.77	203,111.39	n/a	
Ratites	n/a	390.00	195.00	10,445.91	
Rice	57,499.04	1,065,610.27	532,805.14	161,370.04	
Total RIRDC	*1,728,031.58*	*5,982,567.07*	*2,991,283.54*	*8,555,922.19*	
Total Horticulture	39,298,376.92	79,655,871.00	39,827,935.50	40,528,933.30	
	268,651,171.44	**411,017,895.32**	**191,632,955.66**	**225,922,206.97**	

Source: Levies Revenue Service

Not all funding for RDCs is through Commonwealth statutory levies:

- Rural Industries Research and Development Corporation (RIRDC) receives appropriation funding and voluntary industry contributions, in addition to statutory levies income. In 2008-09 the appropriation was $13.81 million, unmatched voluntary contributions of $2.14 million, statutory levies of $1.73 million and matching government contributions of $2.54 million. The appropriation funding is given to RIRDC to invest in R&D related to new and emerging rural industries and national rural issues, such as biofuels research and mitigating the impact of climate change on rural industries.
- Fisheries Research and Development Corporation (FRDC) receives appropriation from the Australian Government equivalent to 0.5 percent of GVP, plus matching funding for eligible R&D expenditure from government of industry contribution up to 0.25 percent of GVP. Industry contributions are collected by the Australian Fisheries Management Authority (AFMA) and state and territory governments, under different arrangements.

- Horticulture Australia Limited (HAL) receives both statutory levies and voluntary contributions for marketing and R&D. The government matches both voluntary R&D contributions and statutory R&D levies up to the 0.5 percent of GVP.
- Section 61 of the Australian Meat and Livestock Industry Act 1997 (the Act) enables the minister to declare donor bodies. Section 66 (1)(b) enables approved donors to have their R&D contributions to MLA matched by the government. Approved donors are the Australian Meat Processor Corporation (AMPC) and LiveCorp, who both receive statutory R&D levies, and the Meat and Livestock Australia (MLA) Donor Company which receives voluntary contributions. The total R&D matchable expenditure by MLA, through its direct R&D levy receipts and contributions through the three donor companies, is subject to the 0.5 percent GVP cap.

(a) **Levies**

In 1997, the Australian Government established a set of principles for developing new statutory industry levies (which were later complemented with guidelines), to assist industries with levy proposals and ensure the rationale and objectives for statutory levies were understood, and that proper industry consultation occurred.

The first principle states that the levy must 'relate to a function for which there is market failure', ie the nature and dispersal of program benefits are such that a private investor would not profit from supplying them. Where markets fail to provide socially desirable levels of investment and public good outcomes, governments may intervene. The statutory levy system brings together a large number of small industry participants collectively to pursue industry priorities, while ensuring that there are no free riders gaining benefits they did not contribute to.

Some of the other principles include:

- a request for a levy must be supported by industry bodies representing, wherever possible, all existing and/or potential levy payers, the relevant levy beneficiaries and other interested parties
- the initiator shall demonstrate that all reasonable attempts have been made to inform all relevant parties of the proposal and that they have had the opportunity to comment on the proposed levy
- a levy may be initiated by the government, in the public interest, in consultation with the industries involved
- the initiator must be able to demonstrate that there is agreement by a majority on the levy imposition/collection mechanism or that, despite objections, the proposed mechanism is equitable under the circumstances
- the levy imposition must be equitable between levy payers.

The Levies Revenue Service (LRS) is the agency within DAFF, responsible for the collection and disbursement of statutory levies. It collects levies on a cost recovery, not for profit basis, which has been operating since 1989. In setting its costs, LRS takes into consideration the size of the industry and the number of levy payers and transactions, and the compliance work that is undertaken. The estimate of LRS's total running costs for a year for all levies forms the basis of calculating costs to industry. LRS's costing model uses the records of actual work undertaken for each levy, as recorded in its levy management system, and adds in other work that is not client or commodity specific. The costing model apportions costs to each levied industry based on the work undertaken by LRS for their levy in the previous financial year.

For example, if ten per cent of all LRS work in a year relates to cattle, the recipient body of that levy will pay ten per cent of LRS's costs for that year.

LRS usually collects levies at the first point of sale or further along the processing chain, depending on an industry's preference or circumstances. There are approximately 9000 collection points, with regional LRS compliance officers to ensure all industry participants are paying the levy. LRS pay the RDCs their levies twice a month, with the RDCs being responsible for submitting their claim for matching Commonwealth funds on expenditure.

The government can initiate an amendment to the collection mechanism of any levy if it ceases to be efficient and practical.

The relevant parliamentary acts and regulations (Appendix A) stipulate the upper limit of the industry levies. The relevant industry sets its levies at the desired level based on its strategic plans and the funds required to undertake its activities.

A new levy or change to a levy must be approved by the collective industry and government before the government will collect it. The government can also impose, in the public interest, a new levy or charge on an industry and review it after a specified time.

The government is not involved in the collection of voluntary levies, with industry responsible for such contributions.

3.4 Governance of RDCs

The governance arrangements of the RDCs vary according to whether they are statutory bodies enabled under the PIERD Act or are industry-owned companies under the *Corporations Act 2001* with a funding and accountability contract with the government.

Table 3.1 (above) above highlights the essential differences that apply, and the variations between the IOCs that have evolved as industry-owned companies have been established and new funding agreements made or renewed. The PIERD Act (Section 143) enables the minister to direct the statutory RDCs in the performance of their functions and the exercise of their powers. The recent reviews of the statutory funding agreements align the industry-owned companies more closely to the statutory RDC in terms of planning and reporting to the government (see Section 5.4).

(a) R&D plans

Under the PIERD Act and the funding agreements, all statutory RDCs and IOCs produce a three to five year R&D plan (also known as the corporate plan or the strategic plan). These plans are expected to set out the high level goals and broad scope of their activities. The plan establishes the agency's objectives and priorities for the period the plan covers, an assessment of the agency's operating environment including its strengths, weaknesses, threats and opportunities, involving future trends and implications, and the strategies the agency intends to adopt in order to achieve its objectives. The R&D plan also outlines how the proposed activities align with the National Research Priorities and Rural Research Priorities (see Section 3.5).

The R&D plans are developed in consultation with the appropriate representative organisations, industry's stakeholders and the government, often through workshops and meetings. These meetings set the scope of the plan at an early stage of its development and help ensure the plan incorporates the needs of agency stakeholders' and is consistent with the National Research Priorities and Rural Research Priorities set by government.

The statutory RDCs must be submit their R&D Plan to the minister for approval no later than two months before the date the plan is to take effect. For the IOCs, the minister is consulted during the development of the plan but approval rests with the company's board.

(b) Annual Operational Plans

All the RDCs must also produce annual operational plans (AOPs), which set out detailed methods for achieving the objectives of their R&D plans. AOPs are forwarding-looking reports that outline the agency's activities for the next financial year, including estimates of likely total income and expenditure. The AOP provides a statement of how these activities align with, and to what extent they will give effect to, the objectives described in the agency's R&D Plan and provide performance indicators, timetables and milestones relating to the agency's proposed activities and expenditure.

The department works with the RDCs in the development of the AOPs to ensure they meet the required governance and legislative responsibilities, reporting spending against the National Research Priorities and Rural Research Priorities. AOPs for the statutory RDCs generally must be submitted no later than two months before the date the plan is to take effect to the minister for approval. While the IOCs are required to submit their plans to the minister, the minister is not required to formally approve them.

(c) Industry-owned companies/government funding agreements

Each IOC is declared as the industry services body under a specific act of parliament, to enable levy funding to be transferred from the Commonwealth and to receive matching payments. A funding contract is made between the government and the industry owned company, setting the terms and conditions. These funding agreements have evolved and been modified according to the government's expectations, the specific industry's requirements and evolving corporate governance requirements under community expectations of performance and accountability.

The first funding agreements were for an unlimited period, but most have since been renegotiated and last for between three and five years. The two remaining funding agreements without a sunset clause (APL and HAL) are in the process of being renegotiated. (MLA's current agreement requires it to be negotiated by 1 January 2011 with a view to renewing it, but there is no actual termination date.) See Section 5.4 for a discussion of the changes that have occurred and are currently in process.

The R&D plan, annual operational plan and funding agreement documents are essential parts of the Acts and governance framework including the planning and reporting obligations stipulated by government to promote transparency and accountability for the expenditure of public funds.

(d) Accountability to stakeholders

Under the *Commonwealth Authorities and Corporations Act 1997* all statutory RDCs are required to provide their annual reports to the minister by 31 October for tabling in parliament. The PIERD Act also requires them to present their reports to their representative organisation at an annual general meeting or meeting of the executive.

Under the *Corporations Act 2001*, the IOCs must present their annual reports to their members at the IOC's annual general meeting, and provide copies to the minister under the funding agreements.

Dairy Australia (DA) and LiveCorp differ in that their legislation requires the minister to table their funding agreements, annual reports and compliance reports in parliament. The compliance reports of both DA and LiveCorp are statements by the minister on the amount of levy payments received by the corporation during the year and whether the minister is satisfied, on the basis of information provided by the company, that the spending of the levy payments complied with their funding agreement with the Commonwealth.

The IOCs are required to have regular meetings with the minister and to provide information to the government as requested, including R&D plans, an annual operating plan, annual reports (including audited financial reports), and compliance reports by the chairperson and managing director certifying the company has complied with the funding agreement. Companies must also undertake an independent performance review prior to renegotiation of funding agreements, develop and implement risk management, fraud control and intellectual property management plans and review these every three years. There is a process underway to standardise and strengthen the accountability requirements of the funding agreement as the renewal of each IOC's agreement is negotiated (see Section 5.4.a).

3.5 R&D priority setting

The PIERD Act's definition of research and development, in relation to a primary industry or class of primary industries, means systematic experimentation and analysis in any field of science, technology or economics (including the study of the social or environmental consequences of the adoption of new technology) carried out with the object of:

a) acquiring knowledge that may be of use in obtaining or furthering an objective of that primary industry or class, including knowledge that may be of use for the purpose of improving any aspect of the production, processing, storage, transport or marketing of goods that are the produce, or that are derived from the produce, of that primary industry or class; or

b) applying such knowledge for the purpose of attaining or furthering such an objective.

This definition, which is also applied to the IOCs, allows for a broad range of activities from basic to applied research, industry capacity building and extension activities.

In developing their strategic plans, all RDCs are required to consult with their industry to ascertain the key issues that require research and investment priorities. Each RDC has its own ways of consulting with its industry to gather this input. DA and Australian Wool Innovation (AWI) are required to undertake industry polls to determine their levy rate – DA every five years and AWI every three years. Industry research priorities are set accordingly. All IOCs are required to undergo an independent performance review, prior to the renegotiation of new funding agreements and levy polls where applicable.

From the government's perspective, public investment in rural innovation and R&D is guided by both the National Research Priorities (established in 2002 and last updated in 2003) and the complementary Rural R&D Priorities. Reflecting the joint funding by government and industry, since 1994 the agriculture minister has periodically issued a statement of rural R&D priorities to ensure that the priorities of government, as well as industry, are incorporated into the RDCs' investment decisions. These rural priorities were last updated in 2007, in consultation with industry, research funders and providers and state and territory governments, and represent a shared set of high-level objectives across sectors and jurisdictions.

In early 2010, the minister wrote to all of the RDCs reinforcing these priorities. He also highlighted his expectations in relation to collaboration between the RDCs and the need for

them to continue to support the Council of Rural Research and Development Corporation's joint evaluation program. (This program is discussed in Section 3.10.)

The Rural R&D Priorities aim to foster rural innovation and guide rural R&D in the face of continuing economic, environmental and social change. Social, environmental and commercial issues are becoming increasingly interconnected as industries respond to community concerns in both their products and production methods. While the priorities fall within broad categories, within each category more detailed guidance is provided on the types of activities investors should focus on in the short to medium term environment.

These priorities recognise that R&D investment is only one element of effective innovation. Improving skills to undertake research effort and apply research findings is a critical element of innovation. Other cultural, attitudinal and financial factors also influence the uptake of research findings and the outcomes. For example, acceptance of, and advances in, sustainable resource management in the farming sector over the last two decades was brought about by the cultural change promoted through the Landcare network.

The RDC model is structured so that it is strongly driven by levy payers focussed on their particular industry. The challenge for the RDCs is to achieve a balance in their investments between public expectations and industry expectations and increasing demands to better address cross sectoral and whole food production and supply chain issues. The Climate Change Research Program administered by DAFF has, through competitive grant funding, directed the focus of some RDCs to an area that presents major cross-sectoral challenges and food production issues. It has also successfully encouraged collaboration among the RDCs.

Rural R&D Priorities (2007)	**National Research Priorities (2002)**
Productivity and Adding Value Improve the productivity and profitability of existing industries and support the development of viable new industries.	Promoting and Maintaining Good Health through strengthening Australia's social and economic fabric and preventive healthcare (healthy food production).
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 whole 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.	An Environmentally Sustainable Australia
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.	Safeguarding Australia
Innovation Skills Improve the skills to under take research and apply its findings.	Frontier Technologies for Building and Transforming Australian Industries
Technology Promote the development of new and existing technologies.	

3.6 Implementing investment funds and relationships with research providers and other funders

Rural R&D in Australia is a complex web of providers, funders and stakeholders. Funders and providers span the Commonwealth, states and NT Government, CSIRO, cooperative research centres (CRCs), universities and private participants. The RDCs have a central role in this system - as their funds contribute approximately 28 percent to the total rural R&D expenditure, they are able to exert considerable influence by leveraging their investment across the research spectrum to achieve better and stronger outcomes for industry.

For example CSIRO received $36.5 million from the RDCs in 2008-09. The RDCs are major investors in the rural related cooperative research centres – in 2008-09 they were connected with 14 of the current CRCs ranging from being the major funding partner and core contributors to participating in particular projects. Universities, in particular regional universities, also supply research services to the rural sector and the RDCs fund many higher education research scholarships.

(a) The National Primary Industries Research, Development and Extension Framework

In recent years, driven by the challenge of needing to do more with less resources, the state and territory governments, under the Primary Industries Ministerial Council (PIMC), have sought to create greater collaboration and coordination of rural research and development. In April 2005 PIMC recognised the challenges within the national R&D system and endorsed the concept of 'National R with Regional D&E'. The concept recognises that basic and strategic research (R) can be provided from a distance, with regional adaptive development (D) and local extension (E) required to improve the uptake of innovation by industry.

On 6 November 2008, PIMC endorsed the National Primary Industries Research Development and Extension Framework (National RD&E Framework) including the development of an overarching inter-governmental agreement.

The National RD&E Framework was jointly developed by the Primary Industries Standing Committee (PISC) members, including CSIRO, RDCs and universities. It includes fourteen industry sector and seven cross-sector research, development and extension national plans. The framework provides the structure and institutional arrangements needed to strengthen national research capability and better address cross sectoral and sectoral research and development. Research, development and extension in primary industries are essential to increasing productivity and sustainability.

Progress on the National Primary Industries RD&E Framework in 2009-10 has been substantial across all industry and cross-sector areas. Each industry sector and cross-sectoral issue has or is exploring its RD&E capacity, research priorities, emerging needs and opportunities. This involves consulting with relevant collaborators (including universities) in each sector to identify resource requirements and implementation issues.

The wine, pork and dairy strategies were endorsed by PIMC on 6 November 2009 and forestry, fisheries and aquaculture, sheepmeat, beef, and the poultry RD&E strategies were endorsed in April 2010. Each of these strategies is now being implemented in consultation with industry stakeholders by the strategy steering committees. The strategies can be viewed on the department's website.

The Climate Change Research Strategy for Primary Industries (CCRSPI) was the first cross-sectoral strategy to be developed and implemented. CCRSPI provides a forum for the RDCs and PISC agencies to coordinate their research in climate change mitigation and adaptation.

Other cross-sectoral strategies under development are animal biosecurity, animal welfare, biofuels and bioenergy, food and nutrition, plant biosecurity and water use in agriculture.

When the Framework is fully implemented, it is expected:

- research capability will become more collaborative, specialised, have larger critical mass and will be less fragmented across the nation. Efficiency and effectiveness of RD&E will be markedly improved overall, although some additional costs could be incurred providing national linkages and to support delivery of regional development and local extension.
- agencies will retain and build capability in fields strategically important to their jurisdictions and industries. At the same time, it is expected agencies will collaborate with others to provide for a more comprehensive national research capability.
- state jurisdictions will decide what their research role is in specific sectors, whereby:
  - "Major priority" means that a jurisdiction will undertake a lead national role by providing significant R&D effort in all or most disciplines of a particular industry. For example, Victoria will have a major priority focus on the dairy industry.
  - "Support" means that a jurisdiction will undertake some R&D, but others will be providing the major effort. For example, New South Wales will undertake some local development of research findings for the pork industry, whereas national research will be led from South Australia.
  - "Link" means that a jurisdiction will carry out little or no research in the field, but will access information and resources from other agencies. For example, Tasmania will access information on beef research undertaken elsewhere.
- the national research capability will be an integral component of a wider innovation agenda, supporting development and extension. To encourage rapid uptake of new technologies, research developed in one location would be available nationally for the whole industry.

Work is underway on implementation and operational issues such as access to research and intellectual property protection, filling capability gaps, overcoming free riding and improving extension services.

By ensuring the substantial resources invested by government and industry in research are managed cooperatively, a more efficient, effective and comprehensive capability will be possible.

The RDCs have embraced the Framework and taken leading roles in developing the sectoral strategies related to their respective industries. They are also contributing to the development of each of the cross sectoral strategies in various ways, including the Climate Change Research Strategy for Primary Industries where they are the major drivers.

(b) The Rural Research and Development Council

The Rural R&D Council was established in early 2009 as the Australian Government's key advisory body on rural R&D. The principal goal of the council is to provide high level advice and coordination to better target and improve the effectiveness of the government's investment in rural R&D.

The council's terms of reference state that it is to:

- develop a National Strategic Rural R&D Investment Plan based on an agreed list of national priorities for profitable, globally competitive, sustainable, innovative and adaptable primary industries
- establish a performance measurement and reporting framework against an agreed list of national priorities and key performance indicators
- provide advice on enhancing cross-sectoral, cross-disciplinary, cross-jurisdictional and international cooperation and collaboration
- provide advice on improving communication and uptake of new knowledge and technology across all rural industries and at all scales of enterprises
- foster innovation as integral to the culture of rural communities and industries
- foster the building of capacity of the rural R&D sector to ensure that Australia is prepared for challenges to global competitiveness, productivity, adaptability and sustainable development into the future, including the challenges associated with climate change, and
- provide advice on any other matters relating to rural R&D referred to it by the minister.

The council will have a central role in facilitating more effective use of public resources to address priority issues of importance to Australia's primary industries and associated value-chains; to enhance the speed of delivery of research outputs to Australia's primary producers and uptake of R&D by them; and to enhance domestic and international cooperation and collaboration.

The council will work closely with the rural R&D corporations and companies, industry sectors, research providers, state and territory jurisdictions and relevant Australian Government agencies to strengthen rural R&D through improved collaboration, facilitation and prioritisation of investment and performance measurement and reporting.

In line with its terms of reference, the council is currently further developing the National Strategic Rural R&D Investment Plan and has commenced the development of a performance measurement and reporting framework. The council has also been very active in attempting to elevate the profile of the rural R&D innovation system.

3.7 International linkages

While Australia has a strong history of innovation in rural industries, its investment in rural R&D remains small on a global scale (see Table 3.4). Australia typically invests $1.6 billion each year in rural R&D, in comparison to the United States which invests an estimated $9.4 billion (approximately half of which is performed by the private sector).

Table 3.4 also shows public investment in Australia is relatively high in relation to gross value of agricultural production. This R&D investment has been a strong driver in productivity growth and enabled Australian industries to compete internationally, against countries that provide production subsidies and protection to their farmers.

As discussed by Frontier Economics (2009), one of the most notable features emerging internationally is the growth in rural R&D spending in China and India. Given the size of Australia and the likelihood for similar research issues in other countries, Australia can potentially make significant gains and value add to our own research investment through greater international collaboration and linkages.

Table 3.4	Public investment in rural R&D	
	$m 2005 purchasing power parity exchange rates*	Per $100 of agriculture GVP - international dollars (2000)**
US	$4,313	1.68
China	$2,268	0.41
Japan	$1,195	2.64
India	$1,075	0.18
Brazil	$727	0.91
Australia	$431	3.36

* Frontier Economics 2009

** Alston et al 2009: The authors have calculated an 'international dollar' unit to remove the effect of exchange rate fluctuations on the comparison.

The extent of international collaboration to build and share knowledge and technology by the RDCs varies across the organisations. The strongest examples include:

- Grains Research and Development Corporation's (GRDC) long standing strong links with the International Maize and Wheat Improvement Centre (CIMMYT) in Mexico and the International Centre for Agricultural and Research in Dry Areas (INCARDA) in Syria, which enable Australian breeding programs to access more than 1,300 drought tolerant and disease resistant wheat and pulse breeding lines.
- Dairy Australia has strategic collaborative arrangements with organisations in Ireland, France, and the Netherlands, Dairy NZ, Dairy Management Incorporated in the United States, and Dairy Farmers of Canada.
- MLA was a partner in the $60m Sheep Genomics program, which involved significant collaboration with AgResearch in New Zealand, as well as collaboration with researchers in the United States, France and the Britain. This international collaboration was essential to the mapping of the sheep genome, which underpins the development of genomics-based approaches to genetic improvement.
- MLA and the US sheep industry are collaborating to implement Australian sheep genetic evaluation tools in the US, via use of LAMBPLAN IP backed by collaborative R&D to customise the LAMBPLAN system to US breeds and production systems.

3.8 Intellectual property

Intellectual property (IP) can be a valuable asset that may provide a significant advantage in a competitive market and a return on creative effort. Unlike other sectors, individual rural producers are generally unable to capture directly the returns from their ideas or research they may individually fund, and there are extensive spillover benefits from R&D to other industries and the community (see Section 2.1 and 5.2). Because of this, the majority of R&D findings funded through industry levies and public investment are freely available in the public domain, rather than commercially through proprietary rights.

To ensure research findings are made available in the optimal way to producers, the RDCs are required to actively manage and promote the IP generated from their R&D investments either through open access or by exerting their proprietary rights.

This ranges from making knowledge widely and publicly available through websites, publications, workshops or conferences through to strictly commercial means where users pay for the rights to use the product.

Most RDCs share any intellectual property developed as part of funded research with partner research organisations. In some cases it is wholly vested with the partner research organisation but the RDC retains an interest in its commercialisation. Commercialisation is generally not a high priority for RDCs as they prefer to pursue other methods to encourage the adoption of R&D findings, such as field days or publications. However, in some situations, they operate through licence agreements, joint ventures or third parties to develop products for market, with a view to commercialisation and attracting other investors.

Royalties and licensing fees from commercialisation represent a small proportion of RDCs' income. In 2008-09, the Cotton Research and Development Corporation (CRDC) had royalty earnings of $1.6 million, representing 21 percent of its income. (This is expected to decline due to new commercial breeding arrangements.) The GRDC earned $2 million (1.3 percent of its total income), which may rise in the future as GRDC negotiates and receives more revenue from plant breeder's rights through commercialisation of its plant breeding investments.

Table 3.5 RDC income from royalties in financial year 2008-09

RDC	Income from royalties ($)	Percentage of total income
Cotton	1,610,254	20.96
Fisheries	-	-
Grains	2,003,000	1.33
Grape and Wine	-	-
Rural Industries	135,000	0.59
Sugar	19,000	0.17
Horticulture	27,554	0.03
Aust. Wool Innovation*	1,805,000	5.26
Aust. Pork Ltd	2,100	0.01
Dairy	-	-
AMPC	-	-
Forest & Wood Products Australia	-	-
Aust Egg Corporation	35 897	0.74
LiveCorp	-	-
MLA	-	-

Source: RDC 2008-09 annual reports

* The figure for Australian Wool Innovation is consolidated, including the royalties earned by companies it owns.

No figures were available for the Fisheries RDC, Grape & Wine RDC, Dairy Australia, Forest & Wood Products Australia, Meat & Livestock Australia, Live Corp Limited or the Australian Meat Processors Corporation.

3.9 Extension and adoption of RDC research findings

Providing formal extension services has traditionally been the domain of state governments, but in recent times state government budgets have contracted and so too has the traditional linear extension model. Participation by governments varies across Australia: some states still invest in a government-funded extension service, some do not; some are 'in the middle' with cost recovery. A significant investment has been made in recent years by natural resource agencies in some jurisdictions and by regional natural resource management bodies and the Australian Government. At the same time the private sector has become more prominent in this field.

While in each industry extension operates differently, extension is now a maze of different providers and access points, through private consultants, agribusiness and input suppliers, local grower groups, and public information obtained through the internet, conferences, demonstrations, workshops and publications. The result is a set of complex communication and delivery channels through which information, knowledge, new learning and ideas flow both ways.

One of the RDCs' functions under the PIERD Act (Section 11.e) is to facilitate the dissemination and commercialisation of R&D. As the extension environment has changed, the RDCs' role has become increasingly important in ensuring the R&D they have funded reaches the end-users and its likelihood of adoption is increased. Each RDC approaches this differently. Some examples include:

- The Victorian Government and Dairy Australia established the Dairy Extension Centre in 2005 as a "virtual" centre of extension capability and program delivery. The Centre operates within the Department of Primary Industries and delivers extension services to meet south eastern Australian dairy farmers' needs. The Dairy Extension Centre provides advice and support to work with farmers and have programs lasting several days to discussion and impact groups, field days, such as "Shed Shake Up's', workshops and on farm visits.
- MLA has a Communication and Research Adoption program, its objective is to communicate, facilitate the use of, and help deliver the tools and information resulting from MLA's R&D to its livestock producer and lot-feeder stakeholders. MLA has focussed its communication and research adoption on awareness, delivery, and capacity building activities to influence producers' motivation, exploration and trialling, and adoption of improved management practices. The Meat Profit Days are a regular feature of MLA's regional calendar and are combination of a field day, conference, trade show and expo. MLA is planning to expand its extension work through its next strategic plan.
- FRDC has a dissemination, extension and commercialisation plan proforma that researchers must complete as part of the approval process.

- GRDC has a communication and capacity building program, which includes support for grower groups, regional workshops, conferences and a wide range of publications and products.
- The FWPA creates knowledge products and uses partnerships, networks and technology to disseminate and enhance awareness of new knowledge and its benefits.

An example of a collaborative extension program is Grain & Graze, which was a collaborative program between Land & Water Australia, the Grains Research and Development Corporation, Meat & Livestock Australia and Australian Wool Innovation and over 60 farmer and Landcare groups, research providers and regional management authorities. Ending in 2008, the program ran for four years across nine pilot regions across Australia. The program invested in research to improve the profitability and sustainability of mixed farms, focusing on cropping, pastures, livestock, profitability, whole-farm economics, farming systems, social issues and natural resources such as soil, water and biodiversity. One of the strengths of the program was the opportunity it gave farmers and farming groups to be directly involved and learn through local trials, development and extension activities, and testing new farming practices on more than 100 research and demonstration sites across Australia.

The effective delivery and enhancement of modern extension services is currently being considered within the National Primary Industries Research Development and Extension Framework by the Primary Industries Standing Committee R&D Subcommittee.

3.10 Evaluation

The RDCs run their own individual monitoring and evaluation programs for their research portfolios. Following the 2007 Productivity Commission review of public support for R&D and at the government's urging, the RDCs agreed to work together to measure and report on the overall return on R&D investment.

The Council of Rural Research and Development Corporations' Chairs (CRRDCC), worked with ACIL Tasman to develop a framework with specific and consistent specifications by which projects could be measured and benchmarked to determine the public and private benefits arising from a wide range of randomly selected projects and help future investment decisions. In developing the framework, the RDCs consulted Australian Government agencies, including the Treasury, the Department of Finance and Deregulation, the Department of Agriculture Fisheries and Forestry, the Productivity Commission and the Australian Bureau of Agricultural and Resource Economics.

The evaluation program was conducted in 2008 and 2009 and is now an ongoing annual program, with a report produced at the end of the evaluation. RDCs engaged independent economic consultants for the evaluations.

The reports concluded that returns from a small number of highly successful projects are much greater than the cost of the total investment in R&D. Further, a randomly selected set of projects shows a strong average return on investment across the portfolio. Social and environmental outcomes are difficult to quantify, leading to a likely understatement of their value.

The 2008 report showed that over a 25 year timeframe, for every $1.00 invested there was an average return of $11.00, in 2007 dollars. The 2009 report builds on the 2008 report, showing

a strong return on investment from the random sample of programs assessed across the RDCs. The benefit cost ratio was 2.36 after five years and 5.56 after 10 years, with the return rising to 10.51 after 25 years.

The RDCs intend to continue to refine the evaluation program as standards and tools are further developed. Further work is needed to demonstrate better the environmental and social impacts arising from RDC investments, with analysis of these impacts to be included in future evaluation reports. In future, it is expected that the outcomes of the evaluation program will be used by the RDC Boards to identify better and direct investments towards the highest returning R&D.

The previous and current government have urged all the RDCs to increase their investment in this evaluation program. This issue was raised in ministerial correspondence to the RDCs in February 2010 and has been pursued through funding agreements as they have been renewed.

4. Discussion of key issues

4.1 Comparing international rural R&D models

Australian producers export internationally in a market where competition is distorted by other governments' protectionist policies and farm income and production subsidies. In contrast, the Australian Government supports its producers through providing funding for R&D, which is the least distorting means of assistance. This funding is mainly through the RDCs, which is unique among international R&D funding models, and is admired by other countries in how it engages the rural sector in funding R&D, setting industry priorities and in generating ownership and uptake of research findings by industry.

In New Zealand the strategic priorities are set by the government, in consultation with stakeholders. Rural research is conducted through the Crown Research Institutes, where the sole shareholder is the government. These institutes are managed by boards, and compete for funding from the government and the private sector.

There is a range of public research agencies in Japan, under the Ministry of Agriculture, Fisheries and Forestry. As a proportion of agricultural GDP, public sector R&D accounts for 2.9 percent compared to 0.1 percent from the private sector (Frontier Economics, 2009).

In Canada, rural research is shared between the federal agency and state agencies. There are some compulsory industry levies for R&D and marketing but, because industry across the border in the United States can free-ride on Canadian research, Canadian levy payers argue that their levies should be directed more towards marketing. Industry levies are not matched by government and some government R&D funding is available to successful applicants on a contestable basis.

In the United States, it is estimated more than half of rural research is funded and conducted by the private sector, and the results disseminated on a commercial basis. There are no industry research levies, and publicly funded research is done by the Agricultural Research Service and the state agricultural experimentation stations and land grant universities. The Agricultural and Food Research Initiative was introduced in 2009 as a result of the US Farm Bill 2008. Under this arrangement a large portion of the agricultural R&D budget is available to researchers through competitive grants, which address the United States government's priorities.

Frontier Economics (2009) estimate that private investment in rural R&D in Britain is about two and half times that of public investment. In Britain there are compulsory industry levies managed by the Agricultural and Horticulture Development Board to address industry issues, which may include marketing and R&D. Government R&D, through the Department of Environment, Food and Rural Affairs, is conducted through a mix of competitive and non-competitive grants.

In comparing investment in rural R&D between countries and in relation to the trends in the United States, Alston and Pardey (2010) preferred the Australian RDC model, concluding:

> *Paying for more of the public support using general tax revenues is but one option, and certainly consistent with the notion that the general population ultimately benefits from this investment by way of lower food prices and access to a broader array of agricultural products with higher quality and other desirable attributes. But farmers who adopt the new technologies arising from R&D also gain by way of improved productivity, lower cost of production, and*

enhanced competitive positions in global food markets. Thus one option is for farmers and other agri-business interests to cofinance the research conducted on their behalf.

Arguably the most straightforward approach is to pass enabling legislation that empowers industry to impose a research levy on producers. One way to encourage producers to implement such a scheme is for the government to provide dollar-for-dollar matching of levy funds up to some predetermined limit (say 0.5 or 1.0 percent) of the gross value of production of the industry.

Such a scheme was implemented to good effect in Australia in 1985, and now almost half of all the funding to agricultural R&D performed by public agencies is jointly financed with taxpayer and industry funding using this institutional instrument. Expanding the range of potential levy payers beyond farmers to include farm input suppliers and the post-farm food processors, bioenergy and other industries that draw directly on the fruits of agricultural R&D could also help address the persistent underinvestment problem in U.S. agricultural research.

4.2 Other Australian business innovation programs

As outlined in the Productivity Commission's 2007 report on public sector support for science and innovation, the government's direct support for business innovation and R&D is through the tax concession arrangements, the RDCs, grant funding, or specific industry programs.

In the 2009-10 Budget, the Australian Government announced it would replace the existing R&D tax concession with a more streamlined R&D tax incentive from 1 July 2010. (At the time of writing this submission the amendment bills setting out the proposed arrangements had lapsed as a result of the Parliament being dissolved with the calling of the Federal Election.)

Under the current R&D taxation arrangements the R&D Tax Offset (a deduction of up to 125 percent of expenditure on R&D activities) is available to companies with an aggregate annual turnover of less than $5 million, or the R&D Tax Concession where they spend more than $5 million. To be eligible, companies must spend $20,000 or more on R&D, bear the technical and financial risk associated with its R&D, have control over the R&D project and effectively own the results. R&D activities funded from voluntary contributions or levy payments are contracted to another party so they are generally not eligible, and only to the extent that such payments relate solely to R&D (AusIndustry, 2008). In 2007-08, 2968 companies claimed the tax offset (less than 1.0% of companies), of which 67 were from the agriculture, fisheries and forestry sector with total claims of $9 million (ATO, 2008).

The government stated that the proposed new tax incentive would improve the incentives for smaller companies to undertake R&D by providing a 45 percent refundable tax credit for eligible core or supporting R&D activities. This was aimed at companies with a turnover of less than $20 million that spend more than $20,000 on such R&D activities. A 40 percent non-refundable R&D tax offset was proposed to be available for all other eligible entities.

The rationale for public support through the taxation system is to encourage R&D activities that will generate new information that also benefits the wider Australian economy, and provide encouragement where there is scientific and technological uncertainty. Accordingly, the definition of R&D that is eligible for the tax incentive centres on activities that are most likely to produce spillover benefits that, in the absence of the incentive, might not go ahead because of their cost and uncertain outcomes (Tax Laws Amendment (Research and Development) Bill 2010, Explanatory Memorandum). This rationale is consistent with the public support offered to rural R&D through the matching funding of R&D levies.

The tax offset is clearly aimed at individual companies with sufficient resources and capacity to undertake core R&D, defined as systematic experimental activities to develop new knowledge (concerning the creation of new or improved materials, products, devices, processes or services) based on principles of established science, and directly related supporting activities. This complements the RDC framework which delivers R&D for a large number of small agriculture, fisheries and forestry businesses through levies and matching funds.

Not surprisingly, only a few agriculture, fishing or forestry companies in the sector are accessing the current R&D tax concession, as the vast majority are excluded due to the expenditure threshold of $20,000 and the spending eligibility criteria. The average farm would be unlikely to spend $20,000 on R&D as it would represent a substantial part of their income. (The average farm cash income for broadacre farms in 2008-09 was $76,610 and $64,345 in 2007-08.)

Other government R&D business programs include the taxation based Venture Capital Limited Partnerships Program (VCLP) and the Early Stage Venture Capital Limited Partnership Program (ESVCLPP). Similar to the tax offset, these programs are not directed at the majority of agricultural, fisheries or forestry businesses. Fund managers seeking to raise a new venture capital fund of at least $10 million for investing in Australian businesses with assets of up to $250 million or $100 million for ESVCLP may be eligible for VCLP or ESVCLPP registration. Registration entitles a fund to flow-through tax treatment. Further, eligible foreign limited partners receive a capital gains tax exemption for gains made on eligible investments.

Equity based programs include the Innovation Investment Fund (IIF) (Powering Ideas, 2009). The IIF Program is a venture capital program that supports new innovation funds and fund managers with expertise in early stage venture capital investing. It co-invests with private sector investors in venture capital funds to assist early stage companies to commercialise the outcomes of Australia's strong research capability.

Enterprise Connect is an Australian Government initiative managed by the Department of Innovation, Industry, Science and Research and offers comprehensive advice and support to eligible small and medium-sized enterprises to help them transform and improve their business.

The cooperative research centres (CRCs) program provides funding to build critical mass in research ventures between end-users and researchers which tackle clearly-articulated, major challenges for the end-users. CRCs pursue solutions to these challenges that are innovative, of high impact and capable of being effectively deployed by the end-users. As discussed in Section 3.6 many of the RDCs are involved in the rural related CRCs.

Other business programs which are exclusive to specific industries include the A New Car Plan for a Greener Future which is a partnership between the Australian Government and the automotive industry, and the National Low-Emissions Coal Initiative, which is a partnership between the Australian and state governments, industry and research to develop low emissions coal technologies.

While individual companies in primary industries have access to some of these business support programs, as a direct investment model they do not lend themselves to individual producers. DAFF maintains that the statutory levy arrangements invested collectively through one agency, with matching funding from the government on eligible R&D expenditure, is the most appropriate model for the agricultural, fisheries and forestry industries, where there are many small producers and high industry and public benefit spillovers.

As the general business support programs are not well suited to the agricultural sector, the current arrangements allow the government to encourage agricultural R&D to a similar extent it is encouraged elsewhere in the economy. As for other industries, there is a case for some support to be directed at R&D that has direct industry benefits as well as R&D that has broader public benefits.

4.3 The role and influence of the RDCs

Since the RDCs were established, their funding, influence and their stakeholders' expectations have grown significantly to the point where they, as the largest single source of rural R&D funding, hold a central position in the whole rural R&D system.

While it is hard to find robust, comparable and consistent data, the spending by state departments has shrunk considerably as a proportion of the total expenditure on R&D and their traditional role in providing linear extension services has declined, while private extension services have grown.

Over the same period of time, the range of rural R&D required has expanded beyond production-based R&D on farm, into more cross sectoral, environmental and supply chain research.

As the knowledge gained from RDC funded projects has expanded and the role of the states has changed, RDCs have taken an increased role in extension to ensure research findings are communicated to producers through a wide variety of paths. For example, GRDC estimates over 200 grower groups now exist through which information is disseminated and learnings shared. Dairy Australia is a major supporter of the Dairy Extension Service in Victoria and has several programs to support dairy farmers, while MLA has held Meat Profit Days since 1993, and is now in the process of expanding its extension role with two new programs in sheep and pastures.

The leading role the RDCs have taken in developing the National Primary Industries Research and Development Framework (see Section 3.6.a) highlights the central role they have in the whole rural R&D system, and the influence they have in directing research priorities and supporting projects, infrastructure and human R&D and industry capacity.

This expanding role and influence, also raises expectations that the RDCs can fund a wider spectrum of research and address downstream and cross sectoral issues, contribute to infrastructure costs, widen their extension role and build science and industry capability. The funding the RDCs receive is being stretched to meet these expectations, but is largely limited by industry growth, willingness to pay and the cap on government matching funding. To adequately address all the needs satisfactorily, more funding is needed.

4.4 RDCs' response to stakeholder priorities

Under the co-investment model, the RDCs' investment strategies should respond to both the government's and the respective industry's operating environment and priorities.

However, this can create pressure on RDC boards as producers expect to see their levies used primarily to improve their profitability and competitiveness. Other broader R&D objectives are often perceived as secondary. These industry priorities are reflected with the largest proportion of R&D investment, across all the RDCs, being directed at production improvement issues. This is potentially at the expense of other issues of national importance to which the government gives high and equal priority such as climate change and biosecurity.

National research and development plans, such as the National Framework for Biosecurity Research and Development developed by the National Biosecurity Committee, and the Climate Change Research Strategy for Primary Industries can provide guidance to RDCs on R&D investment.

The following table indicates R&D spending by the RDCs against the government's rural R&D priorities in 2008-09. Care should be used in interpreting this table as there are no strict guidelines or definitions for reporting data, research spending may not include administration or overhead costs.

The data indicate spending across RDCs on productivity and value adding was the highest at 27 percent, followed by supply chain research (16.5 percent) and sustainable resource management (15 per cent). The proportion of total spending on climate change was 5.3 percent, biosecurity 8.8 percent, innovation skills 13.3 percent, and technology development 14 percent.

While the government writes to the RDCs conveying its priorities in very broad terms, the allocation of investment against these priorities is determined by the RDC boards.

R&D Corporation	EXPENDITURE BY RDCs BY RURAL R&D PRIORITIES for 2008-09														
	Promoting and mantaining good health				An environmentally sustainable Australia				Safeguarding Australia		Frontier technologies for building and transforming Australian industries				TOTAL expenditure
	Productivity & Adding Value	Percentage of	Supply Chain & Markets	Percentage of	Natural Resource Management	Percentage of	Climate Variability & Climate Change	Percentage of	Biosecurity	Percentage of	Innovation Skills	Percentage of	Technology	Percentage of	
	2008-09 in $	%	2008-09 in $	%	2008-09 in $	%	2008-09 in $	%	2008-09 in $	%	2008-09 in $	%	2008-09 in $	%	2008-09 in $
Australian Egg Corp Ltd	356,633	23.3	430,886	28.2	0	0.0	18,000	1.2	173,968	11.4	469,500	30.7	81,056	5.3	1,530,043
Australian Pork Limited	2,475,641	47.7	1,855,737	35.8	222,701	4.3	539,302	10.4	787,388	15.2	1,703,317	32.8	76,813	1.5	5,185,258
Australian Wool Innovation	15,685,000	25.4	31,580,000	51.2	2,600,000	4.2	508,000	0.8	733,000	1.2	4,960,000	8.0	5,581,000	9.1	61,647,000
Cotton Research Development Corp	370,000	5.3	220,000	3.1	2,550,000	36.2	200,000	2.8	2,130,000	30.3	900,000	12.8	670,000	9.5	7,040,000
Dairy Australia Ltd	10,441,730	31.0	5,726,110	17.0	2,357,810	7.0	1,010,490	3.0	1,347,320	4.0	4,378,400	13.0	3,705,130	11.0	33,683,000
Fisheries Research Development Corp	4,000,000	17.2	2,900,000	12.5	10,800,000	46.6	500,000	2.2	1,300,000	5.6	1,200,000	5.2	2,400,000	10.3	23,200,000
Forest and Wood Products Australia	1,452,799	24.0	1,210,666	20.0	1,331,733	22.0	786,933	13.0	363,199	6.0	907,999	15.0	0	0.0	6,053,332
Grains Research Development Corp	30,740,000	28.9	2,530,000	2.4	9,810,000	9.2	6,460,000	6.1	20,940,000	19.7	19,990,000	18.8	14,870,000	14.0	106,250,000
Grape & Wine Research Development Corp	10,521,000	40.2	2,776,000	10.6	4,496,000	17.2	965,000	3.7	209,000	0.8	4,151,000	15.9	3,045,000	11.6	26,163,000
Horticulture Australia Ltd	19,844,318	27.0	16,169,444	22.0	8,084,722	11.0	5,879,798	8.0	4,409,848	6.0	11,024,661	15.0	8,084,072	11.0	73,497,475
Land & Water Australia	1,321,000	4.9	0	0.0	19,150,000	70.5	3,680,000	13.5	0	0.0	2,227,000	8.2	7,960,000	29.3	27,174,000
Meat & Livestock Aust	17,835,200	28.4	9,106,000	14.5	5,275,200	8.4	2,826,000	4.5	6,594,000	10.5	6,845,200	10.9	14,067,200	22.4	62,800,000
Rural Industries Research Development Corp	7,913,000	49.9	903,000	5.7	2,096,000	13.2	250,000	1.6	671,000	4.2	1,190,000	7.5	2,834,000	17.9	15,857,000
Sugar Research Development Corp	3,500,000	42.2	286,000	3.4	1,577,000	19.0	384,000	4.6	682,000	8.2	984,000	11.9	878,000	10.6	8,292,000
TOTAL	**126,456,321**	27.6	**75,693,843**	16.5	**70,351,166**	15.3	**24,007,523**	5.2	**40,340,723**	8.8	**60,931,077**	13.3	**64,252,271**	14.0	**458,372,108**

Note: The data has been obtained from annual reports, with an exception of APL where figures were taken from Annual Operating Plan 2009/2010

APL has identified "other" research investments of $849,732 not aligned to the priorities

4.5 RDCs' accountability to stakeholders

Both the statutory RDCs and IOCs consult with, and are accountable to, government and industry stakeholders through their strategic and annual operational planning processes, annual report publications and, in the case of the IOCs, through performance reviews and levy polls. The extent and arrangements for consultation vary between the RDCs, and depending on needs, can be challenging for the RDCs where industries representative bodies are not well organised or strong.

Under the PIERD Act, the minister must declare at least one organisation as a representative organisation in relation to each statutory RDC. The RDCs must consult with their respective representative organisations in preparing their R&D plans and the chairperson of an R&D corporation must present its annual report and address a meeting of the representative body's executive or annual conference. Tensions can arise within an industry where the nominated industry representative organisation has limited capacity to represent the industry.

While the Productivity Commission (2007) highlighted concerns that government involvement in RDC operations seemed disproportionately light, the RDCs are required to prepare strategic plans, annual operational plans and annual reports for the government's endorsement or approval. The statutory RDCs, Dairy Australia and LiveCorp must have their annual reports and compliance reports tabled in parliament.

Capacity exists in the current system for formal exchange of letters of intent and expectation between the government and RDCs. However, current practice is to communicate priorities on a less formal basis. The current Australian Government has required all the RDCs to submit an outline of their annual operational plans early in the year, and the minister has written to the RDCs at various times outlining the government's expectations and priorities. The RDCs address these priorities in their R&D plans and annual operational plans.

As each IOC's statutory funding agreement is being renegotiated, extra measures are being included to improve the responsiveness to government priorities, and the accountability to all stakeholders (see Section 5.4.b).

4.6 Collaboration and co-investment between RDCs against rural R&D priorities

As investors in R&D, it is the fundamental role of the RDCs to collaborate with research providers and other funders in order for research to be done. The government expects that, with the range of cross sectoral issues that need to be addressed through cross disciplinary research (eg water usage, soil nutrition, weeds, climate change adaptation tools, extension programs), the RDCs would be best placed to coordinate and co-invest between themselves on programs and projects to deliver stronger research findings across the range of industry levy payers.

Such collaboration should aim to overcome duplication and fragmentation in Australia's rural R&D effort, draw on natural synergies, and invest in projects on a scale that is beyond individual RDCs, breaking down the industry "silo" structures and working towards addressing regional or mixed enterprise solutions.

In 2006 the Council of RDC Chairs commissioned ACIL Tasman to identify areas of cross-RDC collaboration. The report made reference to over 70 individual programs and projects where more than one RDC made a financial contribution in 2005-06. However, the financial value of this co-investment represented only 6.5 percent ($35 million) of the total R&D expenditure for 2005-06 ($541 million).

The more substantial successful projects include the Grain and Graze program, which was an extension program run between 2003 and 2008, between LWA, GRDC, MLA and AWI. The Managing Climate Variability program is a co-funded project between GRDC, MLA, DA, RIRDC and SRDC which aims to increase weather forecasting accuracy, build the predictive capability of

events like frost and levels of soil moisture, and develop decision-support tools. A more recent program is the Australian Feedgrain Partnership established between MLA, GRDC, DA, AECL, APL and the Pork CRC.

There are also examples of other programs, where the RDCs are collaborative partners or joint funders, which have been initiated and led by other parties. These include the National Primary Industry Centre for Science Education, where the major funder has been the Australian Department of Education, Employment and Workplace Relations ($3.6 million over three years), with support from the universities, CRCs and RDCs (HAL, FRDC, GRDC and CRDC). The Collaborative Partnership for Farming and Fishing Health and Safety Program is managed by RIRDC on behalf of the Department of Health and Ageing, with the GRDC, CRDC, SRDC, FRDC as partners.

Under the Climate Change Research Program, DAFF is administering nationally coordinated collaborative research programs such as the Reducing Emissions from Livestock Research Program led by MLA with the participation of DA and AWI. MLA coordinates 18 projects across six themes that involve industry, government and research organisations. GRDC is leading the Nitrous Oxide Research Program, with SRDC and DA also participating. These programs demonstrate that the RDCs can collaborate and provide national coordination. The $46.2 million the Australian Government invested in the Climate Change Research Program has leveraged over $100 million in investment from partner agencies, including RDCs, state organisations and universities.

The cross sectoral R&D plans being developed under the Primary Industries Research, Development and Extension Framework, through the Primary Industries Ministerial Council, should help drive stronger collaboration and co-investment. The CCRSPI is the first and most advanced of these plans to be developed so far. This is now a network for sharing and coordinating climate change research in primary industries, with the secretariat at the University of Melbourne. All of the RDCs have committed to CCRSPI and contributed financially to its development, along with members of the Primary Industries Standing Committee. This demonstrates that the RDCs can come together to develop a strategy on a major cross sectoral issue where they all have a common interest.

4.7 Administrative efficiency of RDCs

There are 15 RDCs all with essentially the same R&D (and marketing) investment function for their individual industries. This suggests, there may be efficiencies gained by sharing resources and activities. The Council of Rural Research and Development Corporations is currently reviewing this issue in terms of building on the synergies between the RDCs, reducing duplication, harmonising procedures, and sharing costs where possible in governance, administration, communication and some programs such as people development.

From the data published in the RDCs' annual reports, it is not possible to estimate and compare accurately the operating and overhead costs of the 15 RDCs as accounting practices vary between the RDCs.

4.8 Scale and spread of projects

A strength of the RDC model is that the RDCs have the flexibility to respond to a wide range of issues within their industry. Balanced analysis and judgment is required to determine whether a wide range of small projects should be supported or considerable portion of funds invested in larger scale projects to achieve significant breakthroughs and substantial outcomes. Without consistent data collection it is difficult to draw any firm conclusions on the efficacy of the RDCs project management but, from observation, the RDCs' investment portfolios are generally

characterised by many small shorter term projects, broadly aligned with their strategic plans and research priorities.

4.9 Industry size and R&D capacity

The RDC model lends itself to assisting small and disaggregated industries become established and grow through pooled investments in R&D. However, the relatively small nature of some industries and industry sectors, and their ability to raise levies, can potentially limit the effectiveness of R&D investment and its outcomes.

Industry size and diversity and R&D costs are an issue for RDCs like HAL. With over 40 levy paying industries, it can be difficult to get agreement across these industries to fund joint projects that are of broad benefit to horticulture.

RIRDC has carriage of small and emerging industries and assists them to grow their industry and R&D investment. While some of its industries have successfully established statutory levies under this arrangement, the amount of money collected is relatively small and likely to be insufficient to build a research portfolio of critical mass. Those small industries relying on voluntary levies have even less to invest and rely on RIRDC appropriation funding for extra support to make their research effort feasible. Other industries under the RIRDC portfolio such as the horse and fodder industry have found it very difficult to get industry agreement to a statutory levy and are hence unable to undertake an extensive or comprehensive program of research and take advantage of the government's matching contribution.

5. Looking to the future

5.1 Government's ongoing role in investment in agricultural R&D

The following discussion highlights why the RDC model is still a valid mechanism to manage the partnership between government and industry investment in R&D. The model has not been static and, as government and industry needs have changed over the past twenty years, modifications have been made to the model. This discussion briefly describes changes that have been made or are currently being implemented to improve governance, responsiveness to stakeholder needs and accountability. Beyond these changes a range of options could be considered to improve governance, investment and outcomes.

5.2 Is the RDC model right for delivering rural R&D investment?

In 1989 when the RDC model was established, the rationale for the government's involvement was recognition of the spillover benefits to the community; the substantial risks in some investment; and the potential for "free riding".

The policy principles behind the design of the RDC model were that:

- the aggregate level of spending for R&D should continue to expand as long as the expected social benefits for further funding were greater than or equal to the additional social costs
- the beneficiaries from research should pay in approximately the same proportion to the benefits received
- the appropriate form of government involvement is that which would lead to the optimal level of efficient R&D effort and adoption
- direct government funding is justified in areas of R&D where the external benefits are high and where user-pays funding is not cost effective
- as research is risky, diversification in the types of research institutions is prudent, and
- the public and private system as a whole should be well networked, be faced with incentives to perform well, and respond dynamically to changing incentives (Kerin, 1989).

DAFF argues that the same rationale and principles exist for government involvement in rural R&D investment today. The quantum of investment is more important than ever, given the enormous challenges that industry face to maintain productivity growth, adapt to climate change, continue to be internationally competitive, and maintain the natural resource base.

- *Public benefits spillovers* -As the RDCs have increasingly expanded their research investments into areas such as environmental and biosecurity areas, more public benefits are arising that are beneficial to the wider community, at a regional, catchment and industry level. For example, research leading to efficient water use on-farm will have strong benefits to other producers in the industry and to the wider community in the catchment area by freeing scarce water resources for other uses. Research that leads to better management of biosecurity risks will have substantial spillover benefits to the economy in the form of costs avoided, and better health and welfare outcomes.
- *Industry structure and market failure* - Agriculture has changed in the intervening twenty years since the RDC model was introduced. However, it is still predominantly characterised by a large number of small producers who cannot individually invest in R&D on the scale needed, or quarantine an economic return from direct individual

investment in R&D if investment were possible, although they recognise the benefits of research and development. The increase in industries participating in collective R&D through the RDCs and statutory levies testifies to this, through their willingness to support R&D and share the risks and results.

While the tax concession for research and development is available to individual producers in the rural sector, data from the Australian Tax Office indicates the uptake is very low in the sector and restricted to companies who spend more than $20,000 per annum on eligible R&D where they have a direct interest (see Section 4.2). This threshold would represent a substantial portion of farm cash income and exclude most farmers, hence the levy system and joint investment is more appropriate for agriculture.

Under Australia's intellectual property system, there is limited capacity for individual producers to use patents and plant breeders' rights because of their small scale. These mechanisms are more suited to larger markets for end products, in which companies have invested R&D.

- *Risk and market failure* - Research is inherently risky, can be very costly and may take many years for results to be delivered, with an even longer lag time for the outcomes to be felt by the industry and the wider community. Investment is on the basis that the results are cumulative and will lead to further research and eventually adoption by industry. This long time lag can be unattractive to commercial investment, and therefore it is appropriate for government and industry to work together to address this market failure.

- *Government priorities and influence* - The research being funded through the RDCs addresses not only the overarching objective of improving productivity growth in industry to maintain Australia's prosperity and high standard of living, but also addresses the government's national research priorities (2002) and rural research and development priorities (2007). Such priorities are identified in the expectation they will deliver public benefit, and support the industry/government partnership on which the RDC model is based. This breadth of investment and influence help shape the direction of R&D and leverage funds from other investors in the national rural R&D system (see discussion in Section 3.6).

In addition to this rationale for continued support for government involvement in rural research and development, particularly through the RDCs, there are also other important public policy considerations:

- *Support for industry* - Australian agriculture remains competitive within a highly distorted trading environment and public support to agricultural R&D is critical to this achievement. In contrast with most developed economies, Australia does not routinely provide assistance to agricultural commodity producers through tariff protection, regular income transfers or other production subsidies. Australia's continued agricultural success has been achieved without the high rates of government assistance that its competitors receive in the United States, the European Union and Japan.

- *National coordination and influence* - Governments can encourage greater collaboration across sectors, jurisdictions, research investors and providers to achieve more efficient and effective use of resources and stronger outcomes, develop synergies in combined sustainability and productivity solutions. This is occurring now through the National

Primary Industries Research, Development and Extension Framework, being driven by the Primary Industries Ministerial Council.

- *Means of addressing related public policy issues* - Governments are able to address regulatory impediments to innovation and facilitate responses to other impediments such as skills levels, where their removal is in the national interest but beyond the scope of the industry.

5.3 Funding rural R&D – private versus public investment

DAFF argues the current quantum level of investment in primary industries innovation and R&D needs to be increased to deliver the economic, environmental and social outcomes expected by the industry and community and address the future challenges. Investment should be directed at areas of highest national priority and at those points in the production and supply chain where the greatest return on investment can be achieved, however who should pay is not straightforward.

In the policy statement leading to the establishment of the RDCs, the principles with regard to the level of R&D resources which should be spent on agriculture were stated as follows (Kerin and Cook 1989).

> *In order to encourage industry to assume a leadership role in portfolio research and development, the Government has introduced capped funding arrangements ……. The Government does not believe that total spending of 1 per cent of the commodity's GVP is the appropriate level of industry research and development activity. It should, for most industries, be regarded as a minimum. By the time this minimum is reached, however, industry should itself determine whether the increased funding is warranted. If it is, the industry should fund it.*

As shown in Table 3.2, the levy payers in different industries have taken up this challenge, with many contributing up to the 0.5 per cent GVP cap, and some exceeding it where they consider there are sufficient private benefits from the additional spending.

The Productivity Commission (2007) viewed the RDC model as being inherently sound, with public funding being justified where there were spillover benefits beyond industry members and where that research would not otherwise occur. In a review of US agricultural research in the context of improving global food security, Pardey and Alston (2010) point to the Australian model of industry compulsory levy and government matching funding to a GVP limit as the most straightforward approach to co-fund research of benefit to industry while addressing market failures. "Now almost half of all the funding to agricultural R&D performed by public agencies is jointly financed with taxpayer and industry funding".

Evaluations of research by the RDCs show a high level of benefits to both the private and public sectors well in excess of the investment made, which indicates the RDC model is working.

DAFF believes additional investment is required in the rural R&D system to adequately address the major challenges facing Australia, noting that this is limited by industry growth and willingness to pay. The RDCs have limited capacity to meet growing expectations satisfactorily without some reform to free up resources.

5.4 Changes to RDCs – recent and current

(a) Recent changes

Statutory RDCs – Uhrig reforms - As an outcome of the Review of the Corporate Governance of Statutory Authorities and Office Holders (2003) (Uhrig Review), legislative amendments were made to the PIERD Act to remove the government director positions from the statutory RDC boards, and improve board expertise, experience and management arrangements.
To maintain strong communication between the government and RDCs, the minister periodically meets with the Council of R&D Corporations or with individual RDCs, and writes to them highlighting his or her expectations. The department meets regularly with all of the RDCs at the Council of Rural Research & Development Corporations meetings, has meetings with the chairs and staff of individual RDCs, and is invited to address some RDC boards.

Statutory funding agreements with industry owned companies - The last major review of the SFA accountability framework was in 2004 following the Rural and Regional Affairs and Transport Legislation Senate Committee Report *Australian Wool Innovation Limited - Application and expenditure of funds advanced under Statutory Funding Agreement dated 31 December 2000, February 2004.* The review took into account the findings of the Senate Committee Report and a business risk assessment undertaken by DAFF. Since that time new SFAs have been tightened to include:

- sunset clauses - the introduction of SFA sunset clauses with the requirement for a performance review prior to the negotiation of a new SFA
- certification reports - the introduction of annual Certification Reports by the company Chair and Managing Director certifying that the company has complied with its obligations under its SFA
- agri-political activity - the definition of agri-political activity was strengthened to preclude a company from directly or indirectly funding agri-political activities
- fraud control, risk management and intellectual property management plans - these are now required in all the updated SFAs. In addition, copies of these plans are required to be provided to the department and the plans are to be updated at least every three years.

(b) Current changes

Further changes have been incorporated into the recently agreed SFAs to reflect the continually changing policy environment, changes in stakeholder expectations, and to incorporate some of the principles in the PIERD Act:

- *Government expectations* - by providing the minister the power to give IOCs directions and have a direct input into planning, reporting and performance review processes

- *IOC board corporate governance and performance* – encouraging IOC boards to follow the ASX Corporate Governance Principles including the establishment of a skills based board selected by a nomination committee.

- *Support for emerging priorities* - IOCs are being asked to support emerging policies including contributing to the National Primary Industries Research, Development and Extension Framework, collaboration with other RDCs on priority research and development issues, and increasing commitment to evaluation R&D expenditure.

- *The Australian Government's "Outcomes and Programs (budget) Framework"*, introduced in the 2009-10 Portfolio Budgets, applies to all statutory RDCs. IOCs are also being requested to adopt this framework as their SFAs have been renewed. This structured, standard planning and reporting framework will help in transparency and accountability.

The Council of Rural Research and Development Corporations is also playing a constructive role in facilitating communication and coordinating activities between the RDCs, and acting on their behalf on various issues.

5.5 Further room for modification

- *Extending performance reviews* – Each industry-owned company is now required regularly to undertake a formal external performance review. For consistency, this could be extended to the statutory RDCs. While the statutory RDCs have their own internal reviews of programs, a regular external review of the overall performance of each organisation would be expected to improve the transparency, accountability, performance and evaluation of all the RDCs, by providing benchmarks.
- *Evaluation of research investments* – All RDCs have been encouraged to evaluate their R&D investments, including through the Council of Rural Research and Development Corporation's evaluation program. Further work is needed to strengthen and standardise evaluation methodologies and ensure evaluation becomes an integral component of all R&D investments. The data from this analysis should be utilised by the RDCs to inform their decisions on future investments and project selection.
- *Administrative efficiency and better use of resources* – More efficient use of resources across the RDCs through shared administration, harmonisation of common processes to achieve best practice standards and, potentially, the amalgamation of RDCs would reduce duplication and costs. This would free scarce resources for redirection towards improving research outcomes.
- *Widening the contributions to rural R&D* – as others along the supply chain benefit, either directly or indirectly, from research funded by the RDCs, consideration is needed on how to encourage stronger investment from other stakeholders in the rural sector and supply chain. Options to achieve this may be through new voluntary or statutory levies, or extending matching government funding for voluntary levies beyond the current arrangements.
- *Communication* – Strong communication and a constructive working relationship between the RDCs and the government are essential to the effective functioning of the RDC model. Both parties strive to continually improve this through both formal and informal means. More formal invitations to the government to regular RDC board meetings would enhance this communication and provide an opportunity to meet to discuss priorities and key issues.
- *Collaboration and co-investment* – to achieve the best research outcomes from scarce R&D resources, increased collaboration and co-investment is needed, particularly to deal with high priority cross sectoral issues to address common issues facing all RDCs. There is already evidence of increasing collaboration among some RDCs but this could be strengthened by the establishment and investment of pooled funds for priority R&D. The National Strategic Rural R&D Investment Plan currently being developed by the Rural

R&D Council for the Australian Government's consideration will help guide efforts to increase collaboration and co-investment in high priority areas.

As the RDCs are an integral component of a whole rural RD&E system any fundamental changes to the model would have wide and long term ramifications beyond the RDCs. Potential fundamental changes need to be considered in terms of the contribution of the rural sector to the Australian economy and community, the productivity and competitiveness challenges facing agricultural industry, the RDC's role in relation to the wider rural RD&E system, the RDCs' changing role as investors in research and delivery of extension, and the commitment to and the implementation of the National Primary Industries Research, Development and Extension Framework by all Australian governments.

Appendix A

Legislation relevant to R&D Levies

Imposition Legislation

Primary Industries (Customs) Charges Act 1999

Primary Industries (Excise) Levies Act 1999

Collection Legislation

Primary Industries Levies and Charges Collection Act 1991

Disbursement Legislation

Australian Meat and Livestock Industry Act 1997

Dairy Produce Act 1986

Egg Industry Service Provision Act 2002

Fisheries Administration Act 1991

Horticultural Marketing and Research and Development Services Act 2000

Pig Industry Act 2001

Primary Industries and Energy Research and Development Act 1989

Wool Services Privatisation Act 2000

Appendix B: Current Levy Rates

Buffalo, cattle, livestock, chicken, dairy, deer, goat fibre, pigs, ratites, horses, game animals, macrapods (including kangaroo)

Buffalo Slaughter	$9.60 per head
Buffalo Export Charge	$4.60 per head
Cattle Transaction Levy and (Producers) Export Charge	
Cattle	$5.00 per head
Lot-fed Cattle	$5.00 per head
Bobbie Calves	$0.90 per head
Livestock Transaction Levy and (Producers) Export Charge	
i. Where there **is** a defined sale price:	
Sheep	2% of sale price
Lambs	2% of sale price
Goats	37.7 cents per head
ii. Where there is **no** defined sale price:	
Sheep	20 cents per head
Lambs	80 cents per head
Goats	37.7 cents per head
Maximum levy/charge payable per transaction on a percentage value basis will be as follows:	
Sheep	$0.20 per head
Lambs	$1.50 per head
Meat Chicken	26.74 cents per 100 chicks
Laying Chicken ***(Changed 1/12/09)***	10.67 cents per chick
Egg Promotion	32.5 cents per chick
Dairy Produce	
All Milk Levy – Milk Fat	2.6448 cents per kilogram
All Milk Levy – Protein	6.4438 cents per kilogram
Dairy Adjustment Levy	11 cents per litre (ceased Feb 09)
Deer Slaughter	8 cents per kilogram
Deer Export Charge	$5.00 per head
Deer Velvet	2% sale value
Deer Velvet Export Charge	2% declared value
Goat Fibre	1.5% of sale price
Pig Slaughter	$2.525 per head ***(Changed 1/4/06)***
Ratite Slaughter	
Emus	$2.00 per head
Ostriches	$1.25 per head
National Residue Survey (NRS)	
Horses	$5.00 per head
Game Goats	$0.03 per head
Game Pigs	$0.25 per head
Macropods (including Kangaroo)	
Human Consumption (Kangaroos)	7 cents per head
Human Consumption (other)	4 cents per head ***(Changed 1/10/06)***
Animal Consumption (all)	3 cents per head
Cattle and Live-stock Exporters Charge ***(Changed 1/10/07)***	
Cattle	0.9523 of a cent per kilogram
Sheep (including lambs)	60 cents per head
Goats	50 cents per head
Beef Production ***(Commenced 1/9/07)***	
Cattle slaughter	0.6 of a cent per kilogram
Livestock Slaughter ***(Commenced 1/9/07)***	
Sheep	15 cents per head
Lambs	16 cents per head
Goats	10 cents per head

Appendix B: Current Levy Rates (continued)

Grains, pasture seed, cotton, rice, aquatic animals, dried fruits, dried vine fruits, queen bees, honey, farmed prawns

Coarse Grains		Pasture Seed	
Barley	1.02% ad valorem	Category 1 (Medics)	$10.00 per tonne
Triticale	1.02% ad valorem	Category 2 (Lucernes)	$15.00 per tonne
Oats	1.02% ad valorem	Category 3 (Clovers)	$15.00 per tonne
Cereal Rye	1.005% ad valorem	Category 4 (Subclovers)	$11.00 per tonne
Sorghum	1.02% ad valorem	Category 5 (Serradella)	$10.00 per tonne
Maize	0.72% ad valorem		
Millet	1.005% ad valorem	Cotton	$2.25 per 227 kilogram bale
Canary Seed	1.005% ad valorem		
		Rice	$3.00 per tonne
Grain Legumes			
Field Peas	1.02% ad valorem	Aquatic Animals Levy/Export	Currently set at **NIL**
Lupins	1.02% ad valorem		
Faba Beans	1.02% ad valorem	Dried Fruits (Research)	
Chick Peas	1.02% ad valorem	Vine Fruits	$11.00 per tonne
Mung Beans	1.02% ad valorem	Plums (Prunes)	$13.00 per tonne
Pigeon Peas	1.02% ad valorem	Tree Fruits (not prunes)	$32.00 per tonne
Peanuts	1.005% ad valorem		
Navy/ Kidney/ French Beans	1.02% ad valorem	Dried Vine Fruits Levy/Charge	$7.00 per tonne
Vetch	1.02% ad valorem		
Lentils	1.02% ad valorem	Queen Bees	
Cow/ Wild Cow Peas	1.02% ad valorem	Sold $20 and under	0.5% of sale price
		Sold for over $20	10 cents per queen bee
Oilseeds			
Sunflower	1.02% ad valorem	Honey Levy/Export Charge ***(honey rate changed 1/7/09)***	2.3 cents per kilogram
Linseed (inc linola)	1.02% ad valorem		
Soybean	1.02% ad valorem	Farmed Prawns	
Safflower	1.02% ad valorem	Banana Prawn	3.64 cents per kilogram
Rape Seed (inc canola)	1.02% ad valorem	Black Tiger Prawn	3.64 cents per kilogram
		Brown Tiger Prawn	3.64 cents per kilogram
Wheat Levy	1.02% ad valorem	Kuruma Prawn	3.64 cents per kilogram
Wheat Export Charge	22 cents per tonne	School Prawn	3.64 cents per kilogram

Appendix B: Current Levy Rates (continued)

Grape, wine grape, forestry, nursery, sugar, wool

Grape Research

Less than 20 tonnes	Exempt (seek regional advice)
over 20 tonnes	$2.00 per tonne

Wine Grapes

0 to not more than 10 tonnes	$200 Plus $5.00 for each tonne
More than 10 to not more than 3,000 tonnes	$180 Plus $9.20 per tonne (including first 10 tonnes)
More than 3,000 to not more than 6,000 tonnes	$27,780 Plus $8.80 for each tonne over 3,000 tonnes
More than 6,000 to not more than 9,000 tonnes	$54,180 Plus $7.00 for each tonne over 6,000 tonnes
More than 9,000 to not more than 12,000 tonnes	$75,180 Plus $6.30 for each tonne over 9,000 tonnes
More than 12,000 to not more than 20,000 tonnes	$94,080 Plus $5.60 for each tonne over 12,000 tonnes
More than 20,000 to not more than 40,000 tonnes	$138,880 Plus $5.50 for each tonne over 20,000 tonnes
More than 40,000 tonnes	$248,880 Plus $5.40 for each tonne over 40,000 tonnes

Wine Export

$0 to $20 million	0.20% of value
$20 to $70 million	0.10% of value between $20m & $70m

Forestry

Cypress Sawlogs	22 cents per cubic metre
Export Woodchip Hardwood Pulplogs	3.5 cents per cubic metre
Export Woodchip Softwood Pulplogs	0 cents per cubic metre
Hardwood Sawlog	29 cents per cubic metre
Paper Pulplogs	0 cents per cubic metre
Plywood and Veneer Logs	15 cents per cubic metre
Other Softwood Sawlogs	29 cents per cubic metre
Wood Panel Pulplogs	10 cents per cubic metre
Low Grade Softwood Logs	8 cents per cubic metre
Softwood Roundwood Logs	8 cents per cubic metre
Forest Growers ***(Started 1/11/07)***	5 cents per cubic metre
Nursery Products	5% of purchase price
Sugar Cane	14 cents per tonne
Wool (Shorn)	2% ad valorem

Appendix B: Current Levy Rates (continued)

Grape, wine grape, forestry, nursery, sugar, wool (continued)		
$70 million and over	0.05% of value for $70m and over	
(e.g. If total value of wine is $72m then charge is calculated as follows:	0.05% of value for $70m and over	
First $20m at 0.20% rate =		
$20m to $70m at 0.10% rate =	$50,000.00	
Balance of $2m at 0.05% rate =	$1,000.00	
Total charge payable	**$91,000.00**	

Appendix B: Current Levy Rates (continued)

Horticulture products

Almonds Levy & Charge	
In Shells	1 cent per kilogram
Shelled	2 cents per kilogram
Non-pariel in Shells	1.5 cents per kilogram
Apples & Pears	
Dom & Export Apples	1.845 cents per kilogram
Dom & Export Pears	2.099 cents per kilogram
Dom & Export Nashi	10 cents per single layer 4kg tray
Juicing Apples	$2.75 per tonne
Juicing Pears	$2.95 per tonne
Juicing Nashi	$1.80 per tonne
Processing Apples	$5.50 per tonne
Processing Pears	$5.90 per tonne
Processing Nashi	$3.60 per tonne
Avocados Levy & Charge	7.5 cents per kilogram
Processing	1 cent per kilogram
Banana Levy	1.7 cents per kilogram
Cherries Levy & Charge	7 cents per kilogram ***(Changed 1/09/07)***
Chestnuts Levy & Charge	10 cents per kilogram
Citrus Levy & Charge*	
Oranges in bulk	$2.75 per tonne
Oranges not in bulk	5.5 cents per 20kg box
Other citrus in bulk*	$2.00 per tonne
Other citrus not in bulk*	4 cents per 20kg box
* "Citrus" includes, but is not limited to: grapefruit, lemons, limes, mandarins, tangelos, tangerines	

Hard Onions Levy &	$2.00 per tonne
Lychee	
Domestic & Export Fresh	8 cents per kilogram
Processing	1 cent per kilogram
Macadamia Nuts Levy & Charge	
Dried Kernel	25.21 cents per kilogram
Mango Levy & Charge	1.75 cents per kilogram
Mushroom	$2.16 per kilogram
Papaya (Paw Paw)	
Domestic & Export Fresh	2 cents per kilogram
Processing	0.25 of a cent per kilogram
Passionfruit Levy & Charge	
Packed (18 litre carton)	20 cents per carton
Not Packed	20 cents per **8** kilograms
Processing	1.5 cents per kilogram
Persimmons Levy & Charge	6.25 cents per kilogram
Pineapples ***(started 1/07/09)***	
Domestic & Export	$5.00 per tonne
Processing	$2.00 per tonne
Potatoes	
Domestic & Export	50 cents per tonne
Processing	50 cents per tonne

Appendix B: Current Levy Rates (continued)

Horticulture products (continued)			
Custard Apples Levy & Charge			
Packaged	40 cents per tray/box	Rubus Levy & Charge	11 cents per kilogram
Bulk	$50 per tonne		
		Stonefruit Levy & Charge	1 cent per kilogram
Strawberries (Runners)	$8 per 1,000 (or part there of)		
Table Grapes Levy & Charge	1 cent per kilogram		
Turf Levy & Charge ***(Started 1/10/06)***	1.5 cents per square metre		
Vegetables Levy & Charge	0.5% of sale value		

Appendix C List of Rural Research and Development Corporations

Australian Egg Corporation Limited
Suite 4.02, 107 Mount St
NORTH SYDNEY NSW 2060

Australian Meat Processors' Corporation
PO Box 21
CROWS NEST NSW 1585

Australian Pork Limited
PO Box 148
DEAKIN WEST ACT 2600

Australian Wool Innovation Limited
GPO Box 4177
SYDNEY NSW 2001

Dairy Australia
Locked Bag 104
FLINDERS LANE VIC 8009

Forest and Wood Products Australia
Level 4, 10-16 Queen Street
MELBOURNE VIC 3000

Horticulture Australia Limited
Level 7, 179 Elizabeth Street
SYDNEY NSW 2000

LiveCorp
PO Box 1174
NORTH SYDNEY NSW 2059

Meat and Livestock Australia
Locked Bag 991
NORTH SYDNEY NSW 2059

Cotton Research and Development Corporation
PO Box 282
NARRABRI NSW 2390

Fisheries Research and Development Corporation
PO Box 222
DEAKIN WEST ACT 2600

Grains Research and Development Corporation
PO Box 5367
KINGSTON ACT 2604

Grape and Wine Research and Development Corporation
PO Box 221
GOODWOOD SA 5034

Rural Industries Research and Development Corporation
PO Box 4776
KINGSTON ACT 2604

Sugar Research and Development Corporation
PO Box 12050 George Street
BRISBANE QLD 4003

GLOSSARY

ABARE	Australian Bureau of Agricultural and Resource Economics
ABS	Australian Bureau of Statistics
AECL	Australian Egg Corporation Limited
AMPC	Australian Meat Processors Corporation
APL	Australian Pork Limited
AWI	Australian Wool Innovation
BRS	Bureau of Rural Sciences
CCRSPI	Climate Change Research Strategy for Primary Industries
CRC	Cooperative Research Centre
CRDC	Cotton Research and Development Corporation
CRRDCC	Council of Rural Research and Development Chairs
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DA	Dairy Australia
DAFF	Department of Agriculture, Fisheries and Forestry
ESVCLP	Early Stage Venture Capital Limited Partnerships
FRDC	Fisheries Research and Development Corporation
FWPA	Forest and Wood Products Australia
GDP	Gross Domestic Product
GRDC	Grains Research and Development Corporation
GVP	Gross Value of Production
GWRDC	Grape and Wine Research and Development Corporation
HAL	Horticulture Australia Limited
IOC	Industry Owned Corporations
IP	Intellectual Property
LOB	Line of Business
LWA	Land and Water Australia
MAF	New Zealand Ministry of Agriculture and Forestry
MLA	Meat and Livestock Australia
PC	Productivity Commission
PIERD Act	Primary Industries and Energy Research and Development Act 1989
PIMC	Primary Industries Ministerial Council
PISC	Primary Industries Standing Committee
R&D	Research and Development
RD&E	Research, Development and Extension
RDC	Research and Development Corporation

RIRDC	Rural Industries Research and Development Corporation
SRDC	Sugar Research and Development Corporation
TFP	Total Factor Productivity
UK	Unite Kingdom
USA	United States of America
USDA	United States Department of Agriculture
VCLP	Venture Capital Limited Partnerships

REFERENCES

ABARE 2009, *Australian fisheries statistics 2008*, Canberra, July

ABARE 2009, *Australian Forest and Wood Products Statistics*, March and June quarters 2009, Canberra, November

ABARE, Farm Surveys 2008-09

Austin NR, (2010), *The Science of Food Security*, Paper presented at ABARE Outlook Conference

ABS — Australian Bureau of Statistics (2006), *Research and Experimental Development all sector summary, Australia*, ABS Cat No. 8112

Australian Government, AusIndustry, Australian Taxation Office, R&D Tax Concession, Fact Sheet, January 2010

Australian Taxation Office, Taxation Statistics 2007-08

Carr, Senator (2009), *Powering Ideas, An Innovation Agenda for the 21st Century*, Australian Government

Core, Peter, (2009), *A Retrospective on Rural R&D in Australia*, A background paper for the Rural Research and Development Council

Cutler, Terry (2008), *Venturous Australia, Building strength in innovation*, A review of the national innovation system commissioned by the Australian Government, Cutler and Company

Department of Agriculture, Fisheries and Forestry (DAFF) 2009, National Agriculture & Climate Change Action Plan 2006 - 2009, http://www.daff.gov.au/climatechange/climate/adaptationstrategies/

Department of Climate Change and Energy Efficiency (DCCEE) 2010, *Australian National Greenhouse Accounts: National Inventory by Sector 2008*, http://www.climatechange.gov.au/climate-change/emissions/~/media/publications/greenhouse-acctg/national-inventory-by-economic-sector-2008.ashx

Frontier Economics, *International drivers of rural R&D*, A report prepared for the Department of Agriculture, Fisheries and Forestry on behalf of the Rural R&D Council, December 2009

Gunasekera D, Kim, Y Tulloh, C. and Ford M. (2007). 'Climate Change: impacts on Australian agriculture', *Australian Commodities*, vol. 14, no. 4, December quarter, pp657-76

House of Representatives, *Tax Laws Amendment (Research and Development) Bill 2010, Explanatory Memorandum*, Parliament of Australia

http://www.skillsinfo.gov.au/skills/Industries/AgricultureForestryFishing/

Hughes, N., Sheng, Y., Jackson, T., Lawson, K., Chan, G. (2010, forthcoming), *Productivity pathways: decomposing productivity growth in Australian broadacre agriculture*, ABARE report for the Grains Research and Development Corporation

IC — Industry Commission (1995), *Research and Development*, report no. 44, Industry Commission, AGPS, Canberra

Kah Low and Sinniah Mahendrarajah. *Future directions for the Australian forest industry* – ABARE Outlook Conference March 2010

Kasia Mazur, Robert Curtotti, Christopher Perks, Simon Vieira, Thuy Pham and Daniel George. Australian fisheries - the global context –ABARE Outlook Conference March 2010

Kerin, J. and Cook, K. (1989), *Research, Innovation and Competitiveness: Policies for Reshaping Australia's Primary Industries and Energy Portfolio Research and Development: A Government Statement*, AGPS, Canberra

Liao, B and Martin, P (2009), *Farm innovation in the broadacre and dairy industries, 2006-07 to 2007-08*, ABARE research report 09.16, Canberra, November

Mullen, J.D. (2007), 'Productivity growth and the returns from public investment in R&D in Australian broadacre agriculture', *Australian Journal of Agricultural and Resource Economics*, vol.51, pp359-384

National_agriculture__and__climate_change_action_plan_2006_-_2009

OECD — Organisation for Economic Cooperation and Development (2006), *OECD Agricultural Policies 2006: At a Glance*, Paris.

Pardey Philip J and Alston Julian M, *US Agricultural Research in a Global Food Security Setting: A report to the CSIS food security project*, Centre for Strategic and International Studies, January 2010

PC — Productivity Commission (2006), *Public Support for Science and Innovation*, Draft Research Report, Productivity Commission Canberra.

RRDCs — Rural R&D Corporations (2006), *Public Support for Science and Innovation Research Study*, submission prepared for the Productivity Commission, Canberra.

Salter, A. and Martin, B. (2001), 'The Economic Benefits of Publicly Funded Basic Research: A Critical Review', *Research Policy* 30, pp509-32

Scheales T and Gunning-Trant C, (2009), *Global Food Security in Australia*, Issue Insights 09.8, ABARE, Canberra

Second reading speech by the Minister Representing the Minister for Primary Industries and Energy, Primary Industries and Energy Research and Development Bill 1989, Senate

Shanks, S. and Zheng, S. (2006), *Econometric Modelling of R&D and Australia's Productivity*, Staff Working Paper, Productivity Commission, Canberra

Sheng, Y. (2010, forthcoming), *Productivity Growth and Public R&D Investment in Australian Broadacre Agriculture.* ABARE report for the Grains Research and Development Corporation

Sheng, Y., Mullen, J.D. and Zhao, S. (2010), *Has growth in productivity in Australian broadacre agriculture slowed?*, paper presented to the Australian Agricultural and Resource Economics Society Conference, Adelaide, 10-12 February

Simpson, S. and Dargusch, P. (2010), 'Classifying public benefit in Australian agricultural research', *Australasian Agribusiness Review*, vol. 18, pp30-42

Williams, R and Evans, G (May 1989), Part 2, Commonwealth Policy for Rural Research Past and Present: A Review, in Proceedings No. 4, workshop on the Organisation and Funding of Research for the Rural Industries

Zhao, S., Sheng, Y., and Kee, H.J. (2009), *Determinants of total factor productivity growth in the Australian grains industry*, ABARE conference paper 09.16, December