Submission to Productivity Commission

Review of Rural Research and Development Corporations

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Executive Summary

The positive productivity gains and returns on investment of the research dollar clearly indicate that the RDC model has been working well and should be retained.

The report *Impact of Investment in Research and Development by the Rural Research and Development Corporations'* reveal the following in regards to RDCs:

- a strong return on investment, with a benefit cost ratio of 2.36 after five years and 5.56 after 10 years; and,
- the return rises to 10.51 after 25 years, that is, for every $1.00 invested, $10.51 is returned after 25 years.

More importantly, the above results show that pay back on the investment dollar is quick, with 60 percent of projects showing a positive net present value by year five and 77 percent positive by year 10.

Despite the various constraints such as drought, floods, rising costs and unlevel playing field with major trading partners, Australia's multifactor productivity growth for the agricultural sector averaged almost 3 per cent a year over the period 1974-75 to 2003-04. The key sources of productivity growth has been through advances in knowledge and technology, better use of available technologies and management practices and structural changes such as increases in farm size and shift in enterprise mix.

Recommendations

That the basic concept of the Rural Research and Development Corporations and Companies model be maintained.

The Association recommends that there be clarity over how the innovation and technology transfer issues are addressed by the various agencies concerned.

That an Economic Impact Study of the RDCs Programs be carried out similar to the study of the CRC Programme before deciding on the future of Government funding to RDCs

Introduction

The NSW Farmers' Association (the Association) represents the interests of commercial farm operations throughout the farming community in NSW. Through its commercial, policy and apolitical lobbying activities it provides a powerful and positive link between farmers, the Government and the general public. The Association is the key state representative body for both intensive and extensive industries ranging from broadacre, meat, wool and grain producers, to producers in the horticulture, dairy, poultry meat, egg, pork, oyster and goat industries.

The Association welcomes the opportunity to provide comment to the *Issues Consultation Paper: Rural Research and Development Corporations*. Agricultural Research continues to be a priority issue for the Association as it affects Australian agricultural efficiency and productivity.

According to the United Nations, overall demand for food is expected to more than double by the mid-century. If we are going to be able to feed a more urban and wealthy global population, global food production will need to increase by 70 percent by 2050.

Historically, Australia's agricultural competitiveness in global markets has been driven by a combination of public- and private-sector investments in research, education and technology transfer. While funding for agricultural productivity-enhancing research in Australia has slowed and in some cases declined, other nations, such as Brazil, have increased their investments in agricultural research

To improve long-term productivity growth, it is therefore imperative for government and industry to support agricultural research and development. Investment in research, development and innovation is vital for ongoing growth and improvement in the productivity, profitability, competitiveness and sustainability of Australia's agriculture, fisheries, forestry and food industries.

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It is the Association's belief that the impending global food security crisis will offer considerable opportunities for export focused primary producer nations, such as Australia. It therefore will be in the Government's long term interest to continue to support the various Rural Research and Development Corporations by funding agricultural research.

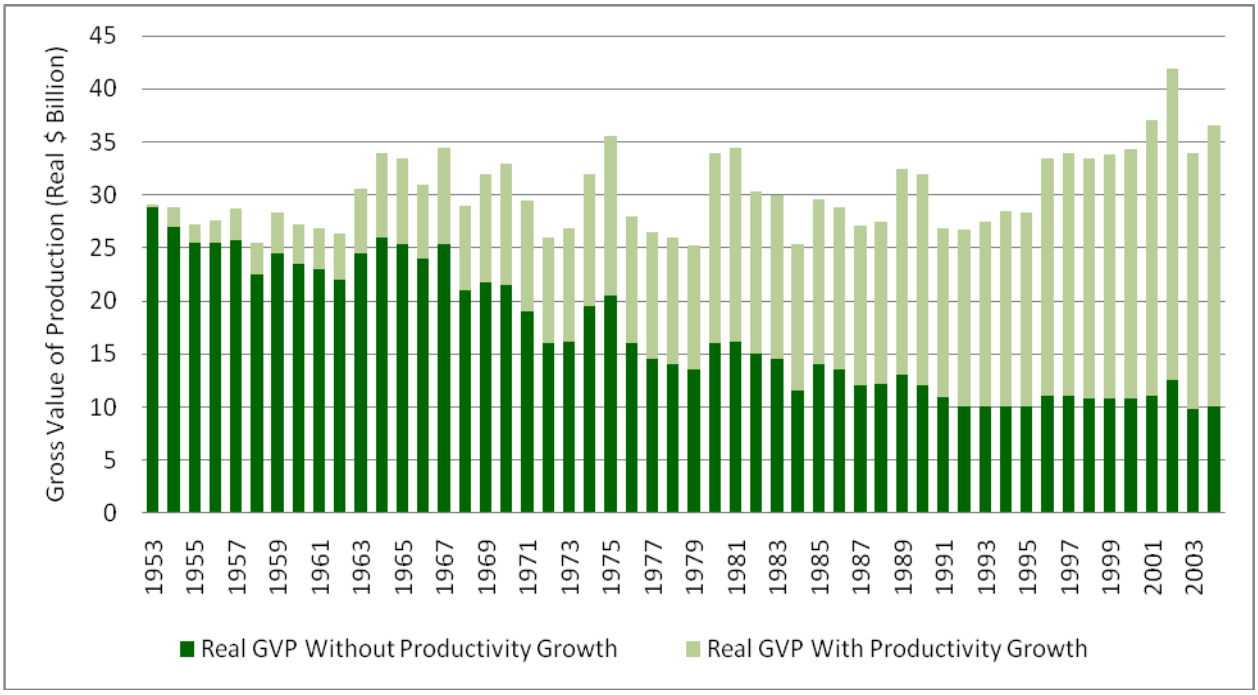
1. Rationale for Government Funding Support

1.1 Increasing Productivity to Stabilise the Gross Value of Production

The Productivity Commission paper[1], *Trends in Australian Agriculture*, found that agricultural output, while quite volatile because of droughts and other seasonal variations, increased by around two and a half times in real terms over the last four decades. This increase in output was achieved without an increase in the number of agricultural workers, reflecting strong productivity growth in the sector.

Increases in agricultural productivity which are attributable to domestic R&D are conservatively estimated to be around 1.2 percent, or nearly half the of the average productivity growth of 2.5 percent[2]. Given increased competition and deterioration in farmers' terms of trade (which ABARE data shows to have been in decline since at least 1953), the viability of agriculture is heavily reliant on this increase in productivity to offset adverse market pressures. This reliance is demonstrated in figure 1**Error! Reference source not found.** which shows the trend of real gross value of production excluding productivity growth.

Figure 1 Effect of Productivity growth on gross Value of Agricultural Production[3]



The finite nature of agriculture's core inputs such as land, labour, fertiliser and water means that production costs are bound to increase alongside demand for food and fibre worldwide. History shows (illustrated in figure 1) that these increased costs will not be met with better farm gate

[1] Productivity Commission 2005, *Trends in Australian Agriculture*, Research Paper, Canberra.
[2] Mullen, J., Orr, L., 2007, R&D: A Good Investment for Australian Agriculture, presented at 51st Annual Conference of Australian Agricultural Resource Economics Society, February 13 – 16, 2007, Queenstown, NZ
[3] Mullen, J., Crean, J., 2007, *Productivity growth in Australian Agriculture: Trends, Sources, Performance*, Research Report, Australian Farm Institute, Surrey Hills Australia

prices, presumably due to distortions caused by agricultural subsidies overseas. Despite this foreseeable trend research intensity is currently at its lowest point in nearly 40 years[4] which could place Australia's primary industries at a substantial international disadvantage in years to come.

In order to mitigate this disadvantage there needs to be a significant and sustained investment in rural R&D to increase the productivity of Australian agriculture and ensure the sector remains internationally competitive.

1.2 Maintaining the viability of rural and regional Australia

Many of the financial assessments of rural R&D overlook the important social and environmental outputs which, while hard to quantify, are among the most important results of the Government's expenditure in this area. Regional communities and agriculture are an integral part of Australia's history and identity. Agriculture is the backbone of most rural economies and underpins a way of life for many of the 1.19 million residents of inland NSW.

Over 300,000 Australians are directly employed by agriculture and around 795,200 are employed in related sectors in rural Australia alone[5]. Without these jobs many rural communities would become unviable.

The environmental benefits of rural R&D are also important to consider. Much of the resources of the RDCs are now dedicated to environmental initiatives and research. Environmental benefits also flow from productivity improvements for instance improved water efficiency in irrigation systems leading to improvements in environmental flows and river health.

The Association acknowledges the private benefit obtained by farmers from environmental improvements which can enhance their long term viability, however these benefits extend well beyond the farming sector. Maintaining waterways and biodiversity and the protection of endangered species are all in the public interest. Accordingly the cost of these improvements (many of which are derived under RRDC R&D) should not be borne solely by the agricultural sector.

Protecting the regional environment and economy means we have an alternative to capital cities as we face the question of where to settle Australia's increasing population. Alternatively, if the agricultural sector was to become unviable these communities would suffer and no doubt look to metropolitan jobs and housing which is already in tight supply. Accordingly, it is crucial to continue to find ways to farm more productively and with regard to the environment.

[4] Mullen J, Orr L (2007) real public investment as percentage of GVP; *R&D: A Good Investment for Australian Agriculture,*
[5] *modelling by Econtech, Australia's Farm Dependent Economy Report, 2005*

1.3 Addressing the market failure in private research and development

The level of private rural research and development in Australia, while improving, is noticeably lower than that of comparable countries (see Table 1). Despite positive moves in the protection of intellectual property such as plant breeder's rights, other factors including potential market size and the cost of servicing that market make Australia a less attractive place to undertake private R&D for trans-national corporations.

Table 1. Level of Private Rural Research and Development[6]

Region	1981 (%)	1991 (%)	2000 (%)
Australia	5.9	20.2	23.5
Japan	36.6	48.4	58.6
United States	50.1	54.3	54.6
Other (19)	45.7	48.5	56.9
Total	43.9	49.6	55.2

Non-excludability also limits the scope of private investment. Much of the research which is of benefit to producers is technique and process based (e.g. researching methods to retain soil moisture in cropping paddocks). Establishing patents for new techniques is difficult and policing those patents even more so, leaving little protection for the outcomes of private investment in this area.

Private R&D on an individual producer level is equally problematic. Without an RDC system it would be impossible to expect the whole of industry to contribute toward R&D projects or limit the outcomes to those who did contribute, resulting in free riders who would obtain spillover benefits. Even if this were possible, it would not address the issue of free riders beyond the agricultural sector who benefit from environmental outcomes and cleaner, cheaper and more affordable food and fibre.

Considering private sector research and development is largely restricted to excludable products the Association does not perceive it as a viable substitute for government investment in rural R&D. There is no evidence to suggest that the current programs undertaken by RDCs displace the private sector or undertake work which could derive an excludable private benefit in the hands of a private company.

[6] Pardey P, Alston J, Beintema N (2006) 'Agricultural R&D Spending at a Critical Crossroads, *Farm Policy Journal,* Vol. 3 No. 1, Australian Farm Institute, Sydney

It is recognised that co-investment opportunities through the Co-operative Research Centres provide opportunities to marry public and private funds to offset some of the cost and risk involved which cannot be redeemed from the end product.

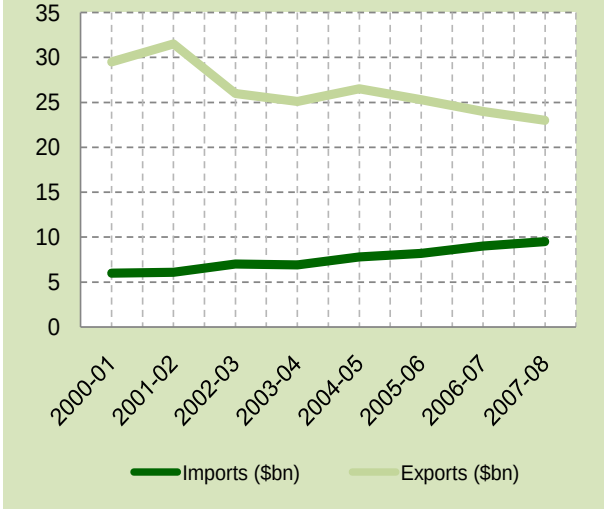
Having a profitable agricultural sector producing affordable and plentiful food and fibre is undoubtedly in the public interest and an aim of the Government support given to rural R&D. Moving R&D to the private sector risks an increase in prices paid for new innovations and decreased access and uptake by producers. The net result of this may be to reduce productivity gains, decreasing returns to farmers and increasing the prices paid for agricultural produce by all Australians.

1.4 Meeting foreseeable challenges

Climate change, urban growth, mining, water policy and fertiliser shortages are all examples of large scale threats to Australian agriculture and overall food security. With Australia's population forecast to double by 2050 we will be under increasing pressure to feed that population despite a decrease in arable farming land. Globally, 1.02 billion people are undernourished, two thirds of whom are located nearby in Asia and the Pacific which poses a strong moral case for Australia to maximise its food production.

Australia is a net exporter of agricultural produce, however we are also increasingly reliant on imports for a number of commodities. This is particularly true for horticultural produce, imports of which nearly doubled between 2000-01 and 2007-08[7]. Figure 2 shows that the difference between our exports and imports has decreased by around $10 billion since 2000-01. This demonstrates a decrease in Australia's overall self-sufficiency and ability to feed its growing population.

Figure 2. Agricultural imports v exports



In 2008, 72 percent of all fishery and farm produce was meat, grain or dairy. To grow a wider variety of commodities in Australia's challenging climate requires a substantial investment in new

[7] $136m imported 2000-01 and $269m imported 2007-08; *Australian Food Statistics 2008*, Department of Agriculture, Fisheries and Forestry

technologies and production methods. The RDC model involves industry in the process to guarantee research outcomes are commercially relevant and likely to be adopted by industry.

"Improving efficiency in farmers' use of agricultural inputs... will become increasingly important as natural resources get scarcer and prices of resources such as fossil fuels, nitrogen and phosphorus increase."

"New technologies and improved practices will therefore also be needed to deal with a changing climate -

Changing government policy has lead to a reduction in the amount of water allocated for agricultural irrigation in favour of environmental flows. Compounded by a changing climate this has the potential to significantly affect the agricultural sector's ability to maintain current production levels. Most RDCs have undertaken research aimed at improving water usage on both an industry-specific basis and collaboratively through initiatives such as the National Program for Sustainable Irrigation.

Other factors such as land use competition from mining and urban expansion threaten the amount of arable land available for farming. Further, discovery and extraction of phosphorous, one of our key fertilisers, is understood to have peaked in 1988[8] and natural gas dependent nitrogen is likely to peak in the near future. Without substantial research into improved production methods these factors will substantially inhibit the productive capacity of Australian agriculture and threaten our overall food security.

The issues raised here are not only domestic, it is estimated that worldwide food production needs to increase by 70 percent by 2050[9] in order to feed an additional 2.3 billion people. In 2008 food riots in 22 countries around the world demonstrated the effect this may have on global stability, particularly in our region. This situation presents a significant opportunity for food exporting nations such as Australia.

The Association believes that the ability for Australia to feed and clothe its population is a benefit which extends well beyond the agricultural sector. The circumstances currently threatening this ability warrant a substantial taxpayer investment to secure future stability.

2. Is the RDC Model Fundamentally Sound?

First, we need to recognize that the Rural R&D system is a complex one (see government R&D policies and priorities below). The Rural R&D system includes farmers; the Federal Department of Agriculture, Fisheries and Forestry; State Departments of Primary Industries; the Department of Innovation, Industry, Science and Research; the National Climate Change Research Facility;

[8] Dery 2008
[9] *Global Agriculture Towards 2050,* Food and Agriculture Organisation of the United Nations 2009

the Universities; the Rural Research and Development Corporations; the Cooperative Research Centers; CSIRO; and Agribusiness from small to multi-national firms.

At the federal level, Rural Research and Development Corporations and Companies (RDCs), of which there are 15, play a leading role in rural innovation. The RDC's funded jointly by the government and the respective industries share the funding and strategic direction setting for primary industry R&D, investment in R&D and the subsequent adoption of R&D outputs.

How effective is the current rural R&D and extension framework, and is the role of the RDCs within that framework appropriate and clearly defined?

The thrust of RDCs R&D and innovation is to improve the productivity and delivery of high quality products in order to underpin the competitiveness and profitability of Australia's agricultural, fish and forestry industries. RDC's R&D and innovation also support the sustainability of primary production and the natural resource base which perhaps is not the case with other agricultural research in the country.

Unlike other agricultural research models and research models of other institutions e.g, CRCs and Universities (highlighted below), the number one strength of Australia's rural R&D system particularly the RDC's, is the partnership that has been built between the government, industry and researchers, and the benefits this has brought giving scientists feedback on farmer needs.

This partnership enables the government and the industries to prioritise, coordinate and integrate the demands of industry and government with the capabilities of research providers. This represents the translational research gap, and puts the RDC system in an ideal position to provide the link between research and industry and to bridge the gap between basic and applied research.

The partnership has delivered advantages to Australian agriculture through the development of practical technologies for farmers. RDC's are recognised by farmers and the rural communities for the valuable role they play within the broader rural R&D system, particularly in applied research and experimental development. The RDCs are regarded by many agricultural research organisations as the major route for the delivery of discovery research to industry.

Recommendation 1

That the basic concept of the Rural Research and Development Corporations and Companies model be maintained.

Federal Government's Rural Research Policies and Priorities

Rural research policies:

- recognise that the large number of small producers could not gain an economic return from individual investment in R&D and that farm products are largely uniform and non-rival in nature;
- address important national development and sustainability objectives, such as biosecurity and natural resource management.
- acknowledge the significant intra- and inter-industry spillovers and regional and rural benefits that accrue from publicly supported R&D; and

The Federal Governments Rural Research Priorities are intended to achieve a national understanding of current critical R&D investment needs and to better target agricultural, fisheries, forestry and food industry R&D efforts. The priorities include:

- Productivity and Adding Value - It is aimed at improving the productivity and profitability of existing industries and support the development of viable new industries.
- Supply Chain and Markets - Better understand and respond to domestic and international market and consumer requirements and improve the flow of such information through the 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.
- Biosecurity - Protect Australia's community, primary industries and environment from biosecurity threats.
- Innovation Skills - Improve the skills to undertake research and apply its findings.
- Technology - Promote the development of new and existing technologies.

The Government's rural research and development policy clearly states that small producers could not gain an economic return from individual investment in R&D and that there is significant intra-and inter-industry spillovers and regional and rural benefits that accrue from publicly supported R&D.

2.1 Capacity in Agricultural Research

Australian Universities and the Private Sector

The available data show that Australia's universities have been strong performers where scientific output has increased over the years and Australia's index of citation impact is at an all time high, currently 1.08 times the world average[10]. In 2004, Australia accounted for 2.891 per cent of world research publications and ranked 9th among OECD countries. Australian triadic patents (USA,

[10] Thomson ISI, 2006, National Science Indicators Database

Japan & Europe) have risen steadily since the mid 1980s, up to 0.82 percent of the world total in 2003 (ranked 14 in the world). Compared with OECD peers, these outcomes are overwhelmingly driven by universities and public research institutions rather than private research. It is imperative that government contribution to RDC's must continue as many of the RDC's work closely with the universities to carry out applied research for the industries. Any reduction in government co-contribution could affect the partnership arrangements between the RDC's and the universities resulting in significant decline in research outputs and income to the universities as well.

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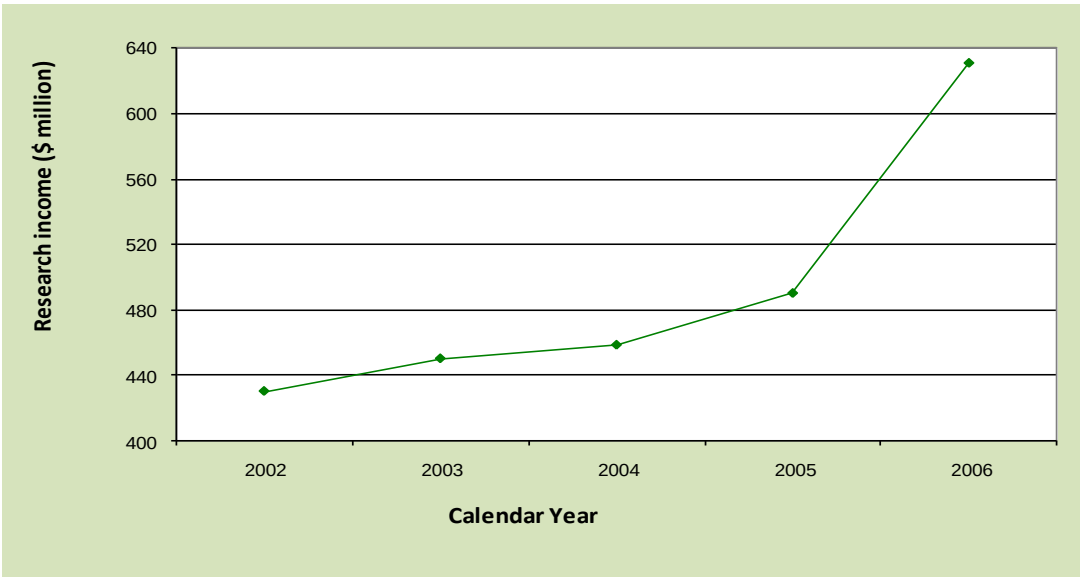
Industry contributions to University research

The research income indicator reflects the judgement of industry and other non-government funding bodies on the capacity of higher education providers to undertake high quality and relevant research. Figure 3 illustrates an increase of 46.8 per cent between 2002 and 2006 in research income from industry and other non-public sources.

Figure 3: Effectiveness indicator—Universities' research income from industry and other sources[11]



[11] DEST Higher Education Research Data Collection for the calendar years 2002 to 2006. Research income sourced from industry and other non-public sources is classified as 'Category 3' income in the data collection.

2.2 Innovation and Technology Transfer

Does the framework facilitate strategic assessment of R&D needs across the whole of the rural sector?

The Australian Bureau of Statistics (ABS) defines innovation as:

> *the application of research and innovation to business processes influences the strength and competitiveness of the economy by providing a basis for innovative change and encouraging economic growth and development*[12].

The delivery of innovation is complex, and is not the responsibility of a single agency. The various organisations need to work together and coordinate their activities and resources for the whole system to work, let alone be effective or efficient. This includes those responsible for prioritising and setting policy on rural R&D investment; those responsible for undertaking R&D; as well as groups and organisations that disseminate and use the outputs of the research. This is reinforced by Termel[13], who defines the agricultural innovation system as a:

> *set of agents that jointly/or individually contribute to the development, diffusion, and use of agriculture-related new technologies, and that directly and/or indirectly influence the process of technological change in agriculture.*

The realty of agricultural innovation is that it involves a more diverse set of agents than is conventionally acknowledged. As a result, innovation and technology transfer requires different sets of functions, the most important ones being technological invention, communication and the adaptation of new ideas for current practice. Every function is equally important, and the stakeholders need to collaborate in order to achieve innovation. The current framework does facilitate strategic assessment of R&D needs across the rural sector.

Is overlap with the work of other Agricultural Research Institutions largely complementary, or are changes warranted to programs?

The question is often asked as to what are the roles of CSIRO, CRCs, RDCs and Universities, where do they overlap and how can we get everyone working together?

Agricultural innovation can perhaps be divided into three different categories, *Product Innovation, Process Innovation and Event Responses.*

Product innovation

These involve the development of tangible, saleable products and include pesticides, new seed varieties, new types of animal feed, vaccines, veterinary medications etc. For these

[12] Australian Bureau of Statistics, 1301, Australia Yearbook, 2008, http://www.abs.gov.au/AUSSTATS/abs@.nsf/bb8db737e2af84b8ca2571780015701e/ec46ec0b1068d0a7ca2573d20010c3c2
[13] Termel, T., Janssen. W., Karimov. F. (2001) *System Analysis by Graph Theorectical Techniques: Assessment of Agricultural Innovation System of Azerbaijan* paper 01-06. International Services for National Agricultural Research (ISNAR), The Hague, The Netherlands, pg 6.

sorts of products, the commercialisation of science is done by industry e.g. chemical and fertiliser companies, and typically involves large multinational firms. As a result information about the new product is driven by the companies in the form of product marketing. It is not transferred directly from the researcher to the farmer. The driver is the manufacturer e.g. Monsanto, Bayer etc, and the link is more likely to be the local distributor/retailer agricultural supplier.

Process innovation

These are activities relating to the development of new systems, models and processes such as new ways of tilling and planting, new breeding and feeding practices, and new ways of tending (e.g. application of pesticides or animal feed etc.) These may be related to the use of new products. The links between research and farming practices in these processes are more direct. The links are also more diffuse, learning based and involve family, community and extension/information.

Event responses

These may be a third area of innovation relating to responses to occasional unusual events, so there is less knowledge about what to do from experience at farm level. Examples of these may be outbreak of locusts, diseases such as foot and mouth, fire, flood etc. Again the links between research and farming practices in these processes are likely to be more direct.

While other institutions involved with agricultural research conduct product or process innovation or event responses, RDC's are perhaps the only organisations that address the whole R&D 'innovation chain', from strategic basic research, applied research, experimental development to commercialisation. This will not be possible without government partnership.

Recommendation 2

The Association recommends that there be clarity over how the innovation and technology transfer issues are addressed by the various agencies concerned.

If State Governments continue to wind back their role in R&D and extension, should the RDCs be seeking to fill the gap, or are there private players that could effectively fill this role?

As highlighted above some RDCs are already performing the research and extension functions including marketing. If State Governments continue to pull out of research and extension, there are no private organisations that will be willing to take on this role due to the costs involved. It is therefore only logical that RDCs take on this role. However this is not going to be possible without funding assistance from government.

2.2 Comparison with other Models

The Cooperative Research Centre (CRC) Models

A study, commissioned by the Australian Government Department of Education, Science and Training (DEST), looked the wide range of economic, environmental and social impacts from the CRC Programme. The study looked at the types of benefits delivered by the CRC Programme through the analysis of a three level hierarchy of economic impacts.

1. Economic impact modelling was undertaken with a view to providing an incontrovertible minimum quantification of the additional economic impacts of the CRC Programme. It included outcomes from the Programme where the outcome occurred as a direct result of CRC Programme funding.
2. Modelling on the outcomes from level one and some additional delivered benefits from the Programme where the issue of the extent to which an outcome was attributable to CRC Programme funding.
3. Modelling to assess the outcomes from level one and two and some additional benefits from the Programme where the benefit was only commencing.

The study concluded that

> *If the only effects on economic performance of the CRC Programme were simple expenditure effects, clearly the overall impact of the CRC Programme on economic wellbeing in Australia would be negative (due to the economic loss involved in collecting and then spending taxation revenues). However, expenditure on CRCs is quite unlike items of government expenditure such as pensions and unemployment benefits, which are transfer payments. Unlike transfer payments, expenditure on CRCs would be expected to lead to positive economic outcomes beyond simple expenditure effects. The knowledge developed in CRCs would be expected to generate improved productivity in existing industries, help the development of new industries, lead to improved environmental and health outcomes (that do have an economic value) and so on. Each of these impacts would act to boost GDP and in turn boost real consumption. In this way expenditure on CRCs generates effects that are in the nature of "investment" effects in addition to the simple expenditure effects on the economy that are associated with any form of government expenditure*"[14].

Unlike transfer payments, expenditure on CRCs would be expected to lead to positive economic outcomes beyond simple expenditure effects

The reports key findings were:

[14] Insight Economics Pty Ltd. 2006, *Economic Impact Study of the CRC Program,*Report prepared for the Australian Government, Department of Education, Science and Training, pg. iv.

For each dollar invested in the CRC Programme (rather than left with taxpayers):

- Australian Gross Domestic Product is cumulatively $1.16 higher than it would otherwise have been.
- Total Australian Consumption is $1.24 higher than it would otherwise have been (Private Consumption is $0.10 higher and Public Consumption is $1.14 higher).
- Total Investment is $0.19 higher than it would otherwise have been.

There has not been a similar study to look at the four level hierarchy of economic impacts of research programs undertaken by the various RDCs. However, Year 2 results on *'Impact of Investment in Research and Development by the Rural Research and Development Corporations'*[15] reveal the following:

- For every $1.00 invested, $10.51 is returned after 25 years
- A strong return on investment, with a benefit cost ratio of 2.36 after five years and 5.56 after 10 years.
- The return rises to 10.51 after 25 years, that is, for every $1.00 invested, $10.51 is returned after 25 years,

While the RDC models have not undergone similar economic evaluation as the CRC model the paper by Rural R&D Corporation 2010[16] indicates similar if not better returns for the research investment dollar. Importantly, the above results show that pay back on the investment dollar is quick, with 60 per cent of projects showing a positive net present value by year five and 77 percent positive by year 10.

Recommendation 3

That an Economic Impact Study of the RDCs Programs be carried out similar to the study of the CRC Programme before deciding on the future of Government funding to RDCs.

The Productivity Commission Issues paper on Rural Research and Development Corporations highlights the following:

Various empirical work indicates that there are significant returns to investment in rural R&D. For example:

- An analysis by Alston et al. (2000) of more than 1100 agricultural R&D projects conducted around the world found a median return on investment of nearly 50 percent and an average return of nearly 100 per cent.

[15] Rural R&D Corporations 2010, *Impact of Investment in Research and Development by the Rural Research and Development Corporations,* pg. iv.
[16] [16] Rural R&D Corporations 2010, *Impact of Investment in Research and Development by the Rural Research and Development Corporations,*

- Mullen (2007) estimated average returns on investment in Australian agricultural R&D to be between 15 and 40 per cent.
- An evaluation by ACIL Tasman for the CRRDCC (2010) reported an average benefit–cost ratio of nearly 11:1 for a sample of 59 RDC projects, assessed 25 years after investment. According to the assessment, all projects in the sample provided a positive return within 10 years.
- The Productivity Commission (2007) reported that returns from public investment in agricultural R&D measured across 42 global studies averaged nearly 60 per cent with a median return of more than 40 per cent[17].

2. Funding Level Issues

2.1. Principles and Benchmarks

What principles and benchmarks should the Commission bring to bear in assessing appropriate funding for the totality of rural R&D, and the right balance between public and private funding.

The explosion of science in recent years has greatly altered how the general public, government funding agencies and the private sector perceive and support scientific undertakings. Research is no longer seen as an expense, but as an investment for the needs of society and for the new economy. Successful research these days requires not only the production of high-calibre science, but also strategies and funding for technology development and transfer to meet the needs of potential users. This environment has made a big difference in the ways researchers and research institutions approach the programming of research and development. Although fundamental research and curiosity-driven research are still the main impetus for new knowledge, such basic investigations are now carried out with a mindset geared to transferring knowledge and technology to end users.

2.2. Determining Right Balance between Public and Private Funding

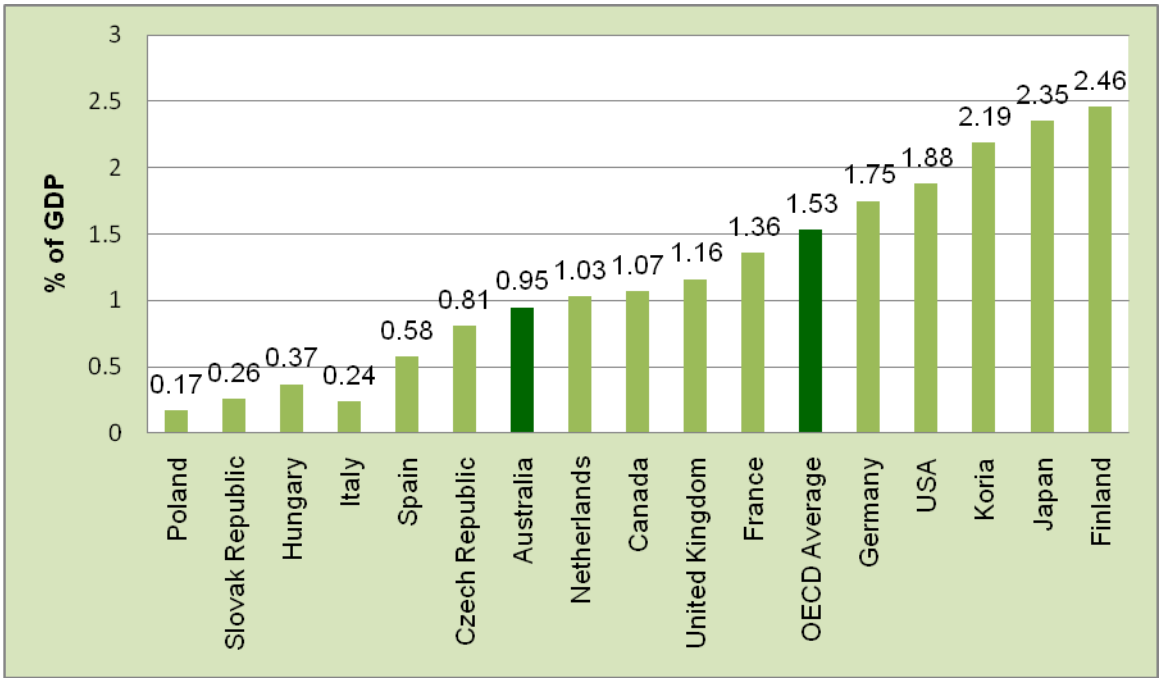
While Australia's science and technology system is strong, it is not able to reach its full potential because of insufficient investment. Gross Expenditure on Research & Development (GERD) as a percentage of Gross Domestic Product (GDP) is at 1.76 per cent, well below the OECD average of 2.26 per cent[18]

Government contribution to research funding has diminished considerably from 76.5 percent in 1978-79 to just 41.4 percent in 2004-05[19]. Industry financing of GERD as a percentage of GDP is

[17] Productivity Commission 2010, *Rural Research and Development Corporations,* Productivity Commission Issues Paper, pg 9.
[18] ABS, Research and Experimental Development All Sector Summary 2004-05, cat no 8112.0
[19] DEST, Australian Science and Technology at a Glance, 2006

also very low by OECD standards (Australia 0.91 per cent, OECD average 1.4 per cent, and Sweden, Finland and Japan in excess of 2 per cent)[20].

Figure 5: Business Expenditure on R&D as percent of GDP, 2004-05 (selected countries)[21]

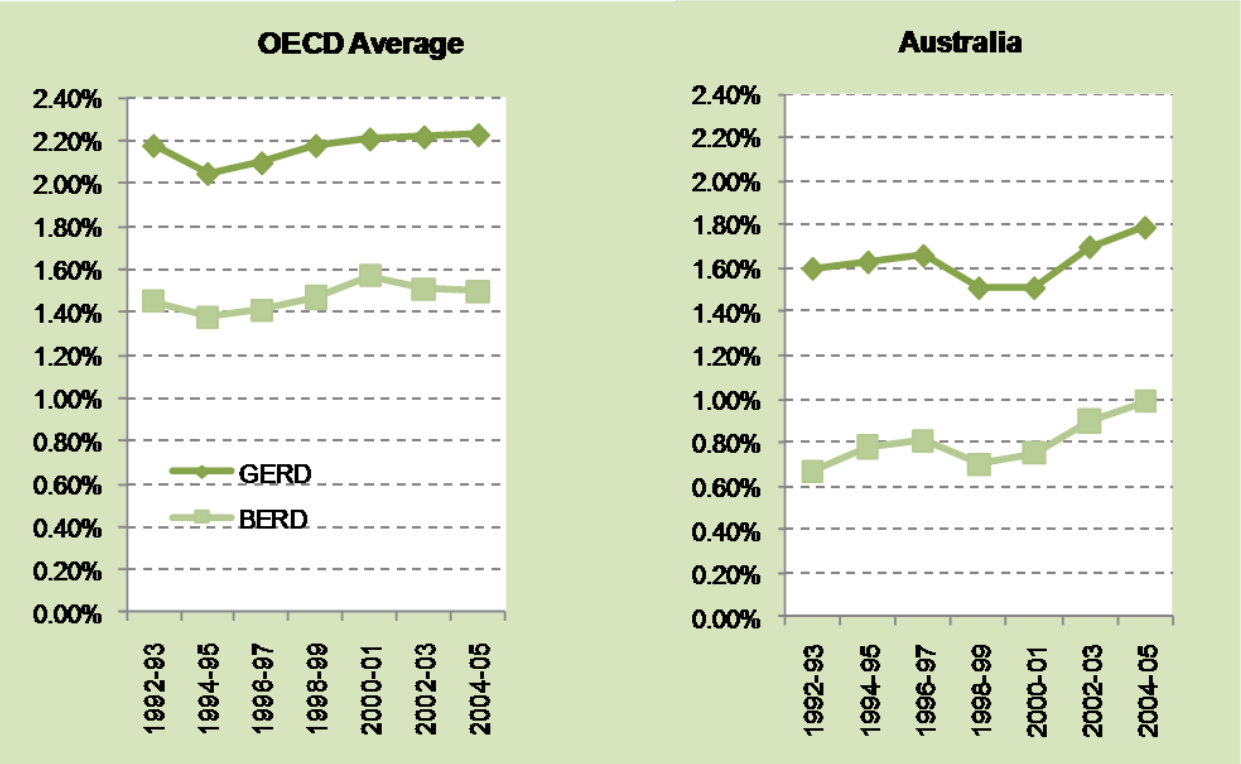


Australia's Public and Private Sector Research Funding vs OECD Countries

Gross Expenditure on Research & Development (GERD) and Business Expenditure on Research & Development (BERD)as a percentage of Gross Domestic Product (GDP) figures reveal that Australia does not contribute as much public and private sector funding to knowledge-based R&D and innovation when compared to other OECD countries. While in recent years there has been some welcome increase in business R&D as a share of GDP this share remains well below the OECD average. Along with a fairly constant public R&D share, this means our overall effort is still well short of even the average OECD benchmark (Figure 6).

[20] OECD, Main Science and Technology Indicators Database, 2006
[21] ABS Research and Experimental Development (8104.0)

Figure 6. Comparison of Australia's GERD and BERD as a percentage of GDP with OECD Average[22]



Some possible explanation for high business support for R&D in OECD countries could be due to the scale of business and the tax incentives given by governments to businesses to invest in R&D.

RDC's together with other research institutions in Australia are well-placed to undertake research with agricultural industries. However the ability of RDC's to commission applied research can only be enhanced by greater government support for agricultural industries R&D and for collaboration incentives such as with tax concession arrangements.

Long-term support from agricultural industries and the government to the RDC's is crucial to developing a vibrant and sustainable innovation platform for agriculture in Australia.

Is there any need to rebalance the Government's funding contribution across the individual RDCs?

The industry levy and matching R&D government contributions for 2008 & 2009 is shown in Table 2. It shows that for 8 industries highlighted, on the average the industry contribution in 2009 was 72 percent while the government contribution was 28 percent. This just goes to show that Government contribution to research funding has diminished considerably over the years as highlighted above.

[22] ABS Research and Experimental Development, All Sector Summary (8112.0) 1992-03 to 2004-05
ABS Research and Experimental Development, Business (8104.0) 1992-03 to 2004-05
Main Science and Technology Indicators Database: OECD 2007.2

Table 2. Industry Levy and Matching R&D Government Contributions – 2008 & 2009

Industry	2008 ($000)			2009 ($000)		
	Industry Levy	Government Contribution	Total	Industry Levy	Government Contribution	Total
Meat and Livestock Australia (MLA)	92,942 (70%)	39,060 (30%)	**132,002**	98,244 (76%)	30,611 (24%)	**128,855**
Grains Research and Development Corporation (GRDC)	76,648 (73%)	28,909 (27%)	**105,557**	89,074 (71%)	36,928 (29%)	**126,002**
Australian Wool Innovation (AWI)	45,110 (79%)	12,312 (21%)	**57,422**	34,307 (75%)	11,395 (25%)	**45,702**
Dairy Australia	29,008 (61%)	18,297 (39%)	**47,305**	29,450 (61%)	19,167 (39%)	**48,617**
Australian Pork Limited (APL)	12,434 (77%)	3,704 (23%)	**16,138**	10,402 (79%)	2,759 (21%)	**13,161**
Rural Industries Research and Development Corporation (RIRDC)	2,214 (45%)	2,706 (55%)	**4,920**	1,840 (42%)	2,530 (58%)	**4,370**
Australian Egg Corporation Limited (AECL)	1,140 (57%)	872 (43%)	**2,012**	1,094 (55%)	909 (45%)	**2,003**
Horticulture Australia Limited (HAL)	593 (46%)	686 (54%)	**1,279**	735 (54%)	636 (46%)	**1,371**
Total for all industries	**260,089 (71%)**	**106,546 (29%)**	**366,635**	**265,146 (72%)**	**104,935 (28%)**	**370,081**

2.3. Economic Arguments for Retaining the RDC Models

If the focus of most of the RDCs is on industry-specific and adaptive R&D and related extension, does this suggest that the bulk of the benefits accrue to levy payers?

Productivity Growth

Productivity growth is central to the performance and international competitiveness of Australia's agriculture sector. Australian farmers are highly dependent on world markets where they are largely 'price takers'. The past 25 years have seen world prices for many agricultural commodities decline significantly in real terms. Farmers are also often unable to exert any control over the prices they pay for their off-farm inputs to production[23].

Despite these constraints Australia's multifactor productivity growth for the agricultural sector averaged almost 3 per cent a year over the period 1974-75 to 2003-04[a].

The Productivity Commission noted in 2005 that the key sources of productivity growth include advances in knowledge and technology, better use of available technologies and management practices and structural changes such as increases in farm size and shift in enterprise mix[24].

Gross Expenditure on R&D and GDP Ratio

While a high Gross Expenditure on Research and Development (GERD) to GDP ratio is not an end in itself, a strong GERD to GDP ratio and innovative capacity underpins higher productivity, sustainable and competitive economy as acknowledged by Productivity Commission[25].

Australia's agricultural sector's reliance upon commodity exports and the unusual structure of its business sector (low numbers of large companies and

- *Agriculture productivity, while quite volatile because of seasonal variations, has exhibited strong growth over the longer-term.*
- *Multifactor productivity (MFP) growth for the agricultural sector averaged almost 3 per cent a year over the period 1974-75 to 2003-04 (or 2.3 per cent a year in trend terms). This was considerably stronger than that achieved in Australia's market sector where the MFP growth rate averaged 1.1 per cent a year (1 per cent a year in trend terms) over the same period.[a]*
- *Agriculture is a strong contributor to the economy's overall MFP growth. Over the period 1974-75 to 2003-04, it accounted for 16.5 per cent of market sector MFP growth. This was more than double it's share of market sector value-added.*
- *Agriculture has exhibited considerably stronger productivity growth from the mid-1990's — in trend terms, MFP increased by around 4 per cent a year between 1993-94 and 2003-04.*
- *Productivity growth has accounted for the entire increase in output by the agricultural sector over the last thirty years and has produced sizeable benefits — an estimated productivity 'dividend' of just over $170 billion.*
- *Over the last three decades, the highest productivity gains have been the next highest achieved by the cropping industry. Mixed crops-livestock, beef and dairy farms achieved growth rates. Productivity growth for sheep and sheep-beef farms has been modest and insufficient to offset the deteriorating terms of trade for these farms.*
- *Key sources of productivity growth include advances in knowledge and technology, better use of available technologies and management practices, and structural changes such as increases in farm size and shifts in enterprise mixes.*
- *International data suggest that, in 2001, labour productivity levels in Australian agriculture were below that for the United States and Canada, but above the OECD average by around 30 per cent. In terms of MFP growth, Australian agriculture has performed relatively strongly over the last two decades — recording a growth rate similar to the United States, but lower than Canada and Denmark.*

Source: Productivity Commission 2005, *Trends in Australian Agriculture,* pg.115.

[23] Productivity Commission 2005, *Trends in Australian Agriculture*, Research Paper, Canberra pg 116.
[24] Productivity Commission 2005, *Trends in Australian Agriculture,* pg.115.
[25] Productivity Commission 2005, *Trends in Australian Agriculture,* pg.115.

large numbers of small and medium enterprises (SMEs) makes its GERD to GDP ratio even more vital. Innovative capacity plays a critical role in adding value to the commodity base of Australia's agricultural exports.

Within GERD, Business Expenditure on R&D (BERD) is an important component and should be seen as a complement to public expenditure on R&D. Current levels of BERD in Australia are low compared with other OECD countries (Figure 5). However, with continued government funding support for the RDC's, strength in both areas can be a powerful engine of progress for the agricultural sector.

Global Knowledge Economy and Spillover

It has been suggested in some quarters that local investment in R&D is unnecessary in the global knowledge economy. Those with this view argue that due to digitalisation full access to the world's information base is accessible. However, recent research demonstrates that:

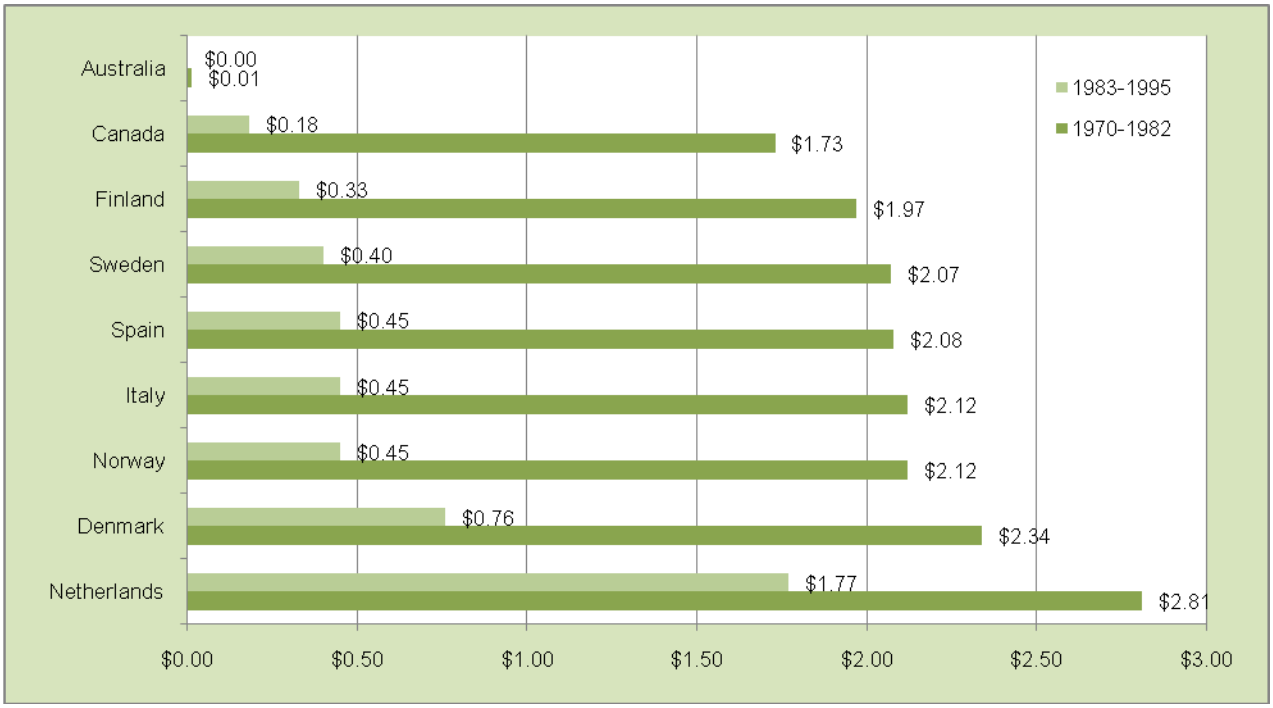
- comparing 1990 with 1970, a one percent distance which previously reduced bilateral exports by 1.2 per cent in 1970, did so by 1.5 per cent twenty years later[26]; and
- the spillovers from knowledge decline by half on average for every 1200 kilometres[27]

Perhaps one explanation for this is that not only does much knowledge require local customisation to work well, but also much of the creative high-level technology needed is tacit knowledge conveyed in direct personal interaction based on co-location. While the Australian agricultural researchers need to maximise their communication links with their overseas counterparts to take advantage of R&D, they must first also maximise their own national research effort to create a larger and more vibrant national innovation system.

Figure 7 illustrates how little Australia benefits from R&D carried out in the United States of America, the United Kingdom (UK), Japan, Germany and France (the G-5 nations). The Association is of the view that even in a highly globalised world, Australia still has a geographic disadvantage to overcome. It is imperative that an enhanced innovation system is part of the solution to this problem through strengthening the partnership arrangements between the government and the agricultural sector.

[26] S Redding and P Schott, 2003, Distance, Skills Deepening and Development, NBER Working Paper, No 9477
[27] W. Keller, 2002, Geographical Location of International Technology Diffusion, American Economic Review, 92 (1), p.120-142.

Figure 7. R&D Spillover Impact on Other Countries per $1 spent by G-5 Nations[28]



3. Improving the RDC Model

The Association is strongly supportive of the RDC model and its structures but does recognise improvements are possible through minor structural changes.

3.1. Enhancing Governance and Board Efficiency

Governance of RDCs is a complex issue given the need for interested stakeholders (ie. industry and government) to have input and ensure work undertaken is in their interest. In the setting of priorities the Commonwealth Government is in a stronger position to make changes than industry because of its ability to control its share unanimously and withhold funding, as opposed to industry which may be comprised of thousands of levy payers. For this reason it is important for levy payers to have input at a Board level on the oversight of the company.

Levy payer oversight of the company provides a number of important benefits, including.

- **Project oversight** – a vast majority of outcomes from RDC R&D are aimed at adoption by producers. Having commercial farm operators overseeing the direction of research means the end results are more likely to be relevant to the industry's needs and adopted.
- **Levy payer satisfaction** – producer support for any levy system would be severely damaged where they were not given strong input into the expenditure of funds. Government control of the levy payer funds may be characterised as a tax and face a substantial levy payer backlash.

[28] W. Keller, 2002, Geographical Location of International Technology Diffusion, American Economic Review, 92 (1), p.120-142

The Association supports the appointment of skills based boards for certain RDCs. This policy recognises that the job of a director is complex and that a populist election model will not necessarily deliver the skills and diversity of views necessary to properly execute the role. The selection committee empanelled to nominate candidates for election is key to the success of this process. Given the well established nature of industry representation in the agricultural industry, it is prudent to consider permanent seats for recognised grower bodies on candidate selection committees.

Those appointed to the board through the selection process may have relevant industry skills, however it is important that they have the support of proper guidelines and external advice to ensure they comply with the best corporate governance practices. The Association recognises that some RDC boards are more effective than others and while there is not necessarily any benefit to standardisation, it may be worthwhile adopting measures to depoliticise and improve the performance of poorer performing boards.

3.2. Industry consultation

RDCs have a varying degree of involvement with their respective grower representative groups. Some, such as Meat & Livestock Australia, have a formalised relationship as part of a larger industry framework. Ensuring recognised representative groups are involved in the direction of RDC work is an effective way of ensuring outcomes are reflective of industry's requirements.

The peak council structures provide a democratic means of addressing the concerns of producers. While the Issues Paper acknowledges a decrease in grassroots participation in these organisations, they still represent the interests of a far larger number of producers than any consultative committees empanelled by individual RDCs could reach.

It is also important to note that grassroots organisations such as the Association, which direct peak council policy, regularly engage non-members through surveys and forums when developing their policy. The Association believes that recognised member organisations still reflect the overall position of the sector and are best placed to oversee the expenditure of its RDC funds through peak councils.

The broadest input occurs annually with the preparation and sign-off of the RDCs operational and implementation plans. Most statutory funding agreements (SFAs) require these to be lodged with government and, in some cases, industry bodies for approval prior to agreeing to the next year's funding. The Association would support more formalised involvement of peak councils in this process to ensure the plans reflect the needs of industry.

3.3. Combining industry services within IOCs

Many industry owned corporations also undertake a marketing role for their specific commodity. Marketing functions are funded through additional industry levies and do not receive any support from government apart from some cost savings derived through their relationship with the RDC (which works equally both ways).

The Association considers this relationship beneficial as market feedback on consumer trends and preferences can influence R&D and achieve better R&D outcomes for producers and end users. This process is demonstrated by Meat & Livestock Australia's Meat Standards Australia (MSA) program, which identifies consumer preferences in red meat products and provides this feedback through the supply chain to influence processing and grower's genetic choices which enables them to meet this demand. The end result is an improved product for consumers and a more valuable commodity for industry.

This positive relationship was noted by the former Minister for Agriculture on the introduction of the *Horticulture Marketing and Research and Development Services Bill 2000*, where he stated the reason for amalgamating horticulture's marketing, policy and research and development bodies as being;

> *"to deliver better industry ownership and involvement in marketing and research and development for the horticulture industries and to allow the synergies between marketing and research and development programs to be fully exploited by the industry."*

The combination of policy work within some RDCs is also often positive. RDCs such as Horticulture Australia Limited (HAL), the Australian Egg Corporation and Australian Pork Limited all undertake this function. Often RDCs are well placed to advise government on industry issues and this function is similar to that of a government funded advisory committee. In the case of HAL, the Horticulture Council which was absorbed in the merger was a government advisory council. Through the merger the government secured industry co-funding to support its running costs and lowered the overall costs through shared administration. The net effect of this was only financial (and positive at that). RDCs which engage in policy represent a subsidised advisory service to government which should be supported where appropriate.

Overall the Association is supportive of RDCs undertaking multiple roles and believe the additional services complement the R&D objectives and add value to the contributions of both industry and government.

3.4. Scope for savings

The Association supports any reasonable changes which add value to our Members' levy contributions. As such we recognise and support any cost savings which could make further funds available for R&D including shared administration services, cohabitation or increased collaboration on certain projects.

One option for achieving most of these aims would be to increase the role of the Council of Chairs of Rural Research and Development Corporations (CCRRDC) to perhaps prepare an across industry strategic plan and provide a central point for shared services. A model for these changes may be the United Kingdom's Agriculture and Horticulture Development Board[29] (AHDB) which employs all staff in the British 'RDC' system, some of which are shared (human resources, market intelligence and finance) while others are allocated to specific commodity groups.

Under this model the board develops a 3 year corporate plan which incorporates plans for each commodity group (which are initially drafted by their respective boards). Centralising this process aims to identify areas for collaboration and skill sharing in addition to creating cost savings.

It is crucial to recognise the benefits of independent, commodity specific RDCs. The independent model allows the development of industry experts with a depth of knowledge in their field, rather than generalists. Too much emphasis on collaboration could also come at the expense of industry specific R&D meaning similar projects are dealt with on a cross-industry basis and lack detailed and useable outcomes for levy payers. For these reasons the Association would oppose moves to reduce the number of RDCs.

Recommending that RDCs which already reside in the same cities share a common location may be a simple means of saving on overheads without substantial structural change. The Association notes the majority of RDCs are currently in either Canberra or Sydney.

The Association supports any measures to increase the value of levy payers' investment without harming the provision of industry specific R&D and other services.

[29] www.ahdb.org.uk