



**The Hon Steve Whan MP**

Minister for Primary Industries  
Minister for Emergency Services  
Minister for Rural Affairs  
Member for Monaro

25 JUN 2010

DGO10/464

Research and Development Corporations Inquiry  
Productivity Commission  
Locked Bag 2, Collins Street East  
MELBOURNE VIC 8003

Dear Commissioner

Thank you for the opportunity to make comment as part of the public inquiry into Rural Research and Development Corporations.

The NSW Department of Industry and Investment believe that the current model for funding primary industries research and development is fundamentally sound and has provided significant benefits to NSW and Australia.

The attached submission outlines: the Department's response to the Commissions Issues Paper; the Departments views regarding the potential to make improvements; and, the strong view of the Department that the model remains a highly effective one that should not be radically changed.

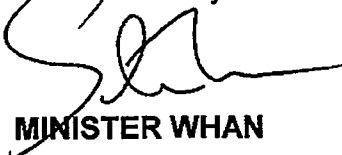
Officers of the Department would be delighted to discuss the submission with the Commission, and arrangements could also be made for the NSW Chief Scientist and Engineer, Professor Mary O'Kane to participate.

If there are aspects of the submission you wish to consider in more detail, please do not hesitate to contact the Director General of the Department of Industry and Investment, Dr Richard Sheldrake.

Dr Sheldrake maybe contacted by phone on 8289 3905 or via email on [richard.sheldrake@industry.nsw.gov.au](mailto:richard.sheldrake@industry.nsw.gov.au).

Thank you again for the opportunity to make a submission to the inquiry.

Yours sincerely



**MINISTER WHAN**

Encl

# **Productivity Commission Inquiry into the Australian Government Research & Development Corporations Model**



**Industry &  
Investment**

**Submission by  
Industry & Investment NSW**

**June 2010**

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## EXECUTIVE SUMMARY

I&I NSW believe that the current RDC model is fundamentally sound and has served primary industries and the community of both NSW and Australia well. In particular the model, whereby Government and industry co-invest, is recognised internationally for its strengths and delivers a “clever” bundling of industry and public outcomes. The modest investment by Government (both at a Commonwealth and state) level in this model is a highly effective in preparing Australian primary industries and community for future challenges and for driving productivity and sustainability in the sector. The investment is complimentary to more traditional government policy “levers” and in many instances provides an effective alternative to these - for example, being much less trade distorting than subsidies and less coercive than a heavy reliance on regulatory approaches.

Australia’s rural industries, along with the Australian community, face a rapidly changing world that is fiercely competitive, full of uncertainty, and contains major challenges including: climate change; and, energy, water and food security issues. The need for a sound rural innovation system is increasing not diminishing and the market failure context relevant to primary industries is becoming more complex and persuasive rather than less so and requires ongoing government investment. The RDC model has been the “glue” that has enabled Australia’s rural industries to rapidly adapt and adopt new technology and to create sustainable value from Australia’s unique natural resource base. Further, the model directly engages farm businesses, as they are all contributors to the system, and as such ensures a high degree of uptake and ownership.

There is a substantial body of evidence that productivity growth in Australian agriculture has been strong (averaging 2.5 percent per annum over a 50 year period) and that around half or more of this has been driven by research and development (R&D). The potential plateauing or decline in productivity which some commentators are now noting in the sector is likely to be due to a reduction in R&D investment rather than a flaw in the model itself. While harder to measure, the environmental and social benefits of the RDC system are likely to be at least equal to the economic.

One of the less recognised strengths of the model is its true co-investment nature - that is, it attracts industry, Commonwealth and state investment in such a way that generates a more balanced portfolio of investment (both in terms of strategic v applied, long term and short term and industry and public good) than could be achieved if the parties were operating independently.

Any reduction in the current dollar for dollar matching of levies by Commonwealth funds will have a very broad impact not only in unbalancing the portfolio but in dramatically reducing the overall effort on rural R&D. The RDCs provide cash into the system, which leverages investment from other research organisations such as state DPI’s and universities. Removing or reducing the RDC cash will create a multiplier reduction in R&D effort.

As with all systems there is room for improvement particularly in: coordination of cross sector public good research (especially after the removal of Land and Water Australia); and, governance that both reduces the risk of RDCs investing in peripheral activities instead of core research and in the fisheries area to ensure a better alignment to public good outcomes.

I&I NSW strongly believes that there are significant risks in radically reforming the current system and we argue any changes should be incremental and targeted rather than systemic.

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## INTRODUCTION

The NSW Department of Industry and Investment (I&I NSW) welcomes the opportunity to contribute to the review into Rural Research and Development Corporations (RDCs).

This submission is framed in response to the Productivity Commission Issues Paper – “Rural Research and Development Corporations, March 2010” and attempts to address a number of the issues raised that are of particular importance to I&I NSW.

## BACKGROUND

### *The NSW Department of Industry and Investment*

I&I NSW has been established to help build a diversified State economy that creates jobs. The Department aims to attract investment to NSW and support innovative, sustainable and globally competitive industries through strong technical, knowledge and scientific capabilities.

Within the primary industries sector the Department acts in partnership with industry and other public sector organisations to foster profitable and sustainable development of primary industries in New South Wales. A key tool the Department uses to achieve these outcomes is strategic scientific research which underpins the growth, sustainability and biosecurity of primary industries in NSW.

I&I NSW's research model is based on co-investment. This means that the Department invests along with industry and other jurisdictions (including the Commonwealth) to undertake strategic science that is of benefit to NSW primary industries and the NSW community. The Rural Research and Development Corporations (RDCs) are an important part of this collaborative co-investment approach representing about 20% of the external funds received by the Department for science.

I&I NSW is a significant investor in strategic rural research with more than 700 staff involved in related activities and more than 900 current research projects.

### *The Contribution of Primary Industries to the NSW Economy*

Primary industries make a major contribution to the social, environmental and economic wellbeing of the NSW community.

In NSW, the primary industries sector has a gross value of production of \$23 billion (including \$15.7 billion in exports) directly employs over 98,000 people, accounting for 11.3% of the non-metropolitan workforce. Primary industries provide 50.7% of NSW's merchandise exports (I&I NSW 2010). Table 1 shows the contribution of the agricultural, fishing, forestry and mining industry sectors in NSW to the gross value of production, employment and exports.

**Table 1. Gross value of production, exports and employment of primary industries in NSW (2007/08)**

<i>Sector</i>	<i>Gross Value (\$ million)</i>	<i>Exports (\$ million)</i>	<i>Employment (persons)</i>
Agriculture	8,590	4,067	73,420
Fisheries	149	25	1,815
Forestry (sawn logs delivered)	379	164	2,522
Mining	14,028	11,464	20,318
<b>Total</b>	<b>23,146</b>	<b>15,719</b>	<b>98,075</b>

*The Contribution of Primary Industries to the NSW Economy, Key Data 2010*

## **ECONOMIC AND POLICY RATIONALES FOR GOVERNMENT INVESTMENT IN RURAL R&D**

It is widely recognised that R&D has a significant role in driving productivity growth, lifting living standards and improving the quality of life. R&D is also widely identified as an important factor in enabling an economy to adapt to shocks and future uncertainties. As a result, R&D and broader innovation policy is increasingly seen as a central aspect of economic policy (Nelson and Nelson 2002; Cutler 2008).

Rural R&D is likewise an important contributor to productivity growth and sustainability in the rural sector and therefore in maintaining the fabric of Australia's regional and rural communities.

As noted by the Commission (PC 2007 p100) the fact that knowledge can not be contained and spills over beyond the investor continues to be a key rationale for government investment in R&D.

### ***Spillovers and Rural R&D***

There are a number of reasons why knowledge spillover is a particular problem for the rural sector.

A particular characteristic of agriculture<sup>1</sup> is that it is made up of a very large number of relatively small producers, with limited capacity to prevent broad uptake of innovations. Together, this means that individual producers generally possess neither the capacity nor incentive to engage in substantial R&D activity. A further issue is that most agricultural industries are highly geographically dispersed, which hinders the ability of these industries to take collective actions. Part of the strength of the current RDC model is that it partially addresses this issue by facilitating the collection of industry levies.

In addition, primary industries face a high degree of uncertainty including: product prices; climate variability; climate change; access to water; increased biosecurity threats; unstable policy environment (eg. CPRS); and, threats to key inputs (eg. energy which in turn impacts on fuel prices, fertilizers, and chemicals). This high degree of uncertainty reduces the incentive for industry investment in R&D. This is exacerbated by the fact that R&D is an inherently risky business in itself (many projects fail).

These characteristics of the rural sector are likely to result in underinvestment by industry in rural R&D from a societal perspective.

It is important to note that where spillovers have been addressed by improved property rights (eg. patenting of agricultural chemicals and machinery and the development of plant breeders rights) government has predominantly withdrawn from these areas of research.

### ***Rationales in addition to spillovers***

There are a number of other important rationales that justify government investment in rural R&D that the Commission should take into account including:

- To provide "absorption capacity" through a domestic research system and highly skilled scientific workforce to "absorb" overseas innovations.
- As an additional or alternative tool to economic, environmental or social policy.
- To meet moral obligations regarding food security in developing nations

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<sup>1</sup> Agriculture is used in this submission to refer to agriculture, forestry and fisheries (in keeping with ABS classifications) unless otherwise stated.

- To address other forms of market failure – reducing negative externalities from the use of the resource base
- For policy support eg. government requires information in order to frame policy

*1) To provide “absorption capacity” through a domestic research system and highly skilled scientific workforce to “absorb” overseas innovations.*

At a firm or business level one of the key reasons to invest in internal R&D is not so much to generate new innovations but to enable the firm to absorb and adapt innovations from other sources including from public research institutions (Cohen and Levinthal 1990, Rosenberg 1990). At a national level, for science and technological innovations, the same principles hold. It is essential to be a part of the global innovation market to take advantage of the global knowledge pool and international spillovers.

This means that even if a country does not aim to be the creator of innovations it still requires “absorption capacity” through a domestic research system and highly skilled scientific workforce to “absorb” overseas innovations (Nelson and Phelps 1966; Abramovitz 1986; Dowrick, 2003).

For Australia, this is even more important than many developed nations as we are a relatively minor player on a global scale in science and research, representing only about 2 - 3% of all scientific publications (PC 2007). As Cutler (2008) notes, there is a compelling argument for Australia to maintain a strong domestic R&D capacity to enable it to access, and take full advantage of, the other 98% of innovations generated overseas.

This is particularly the case for Australian agriculture which, unlike many areas of research where adapting overseas innovations is relatively straight forward (eg. physics, engineering, mathematics, medicine), agricultural and broader environmental sciences require much more intense localisation due to the unique, highly variable and vulnerable environmental and biophysical characteristics of Australia.

As such Australia requires a significant government investment in R&D capability in the environmental, biological and agricultural sciences.

*2) Provision of an additional or alternative tool to economic, environmental or social policy.*

Total expenditure by all levels of government (local, state and Commonwealth) on all agriculture issues in Australia in 2007-08 was \$6,411 million (Table 1). This represents 1.6% of total government expenditure and is less than half that of the expenditure on recreation and culture (\$13,634 m) and about a twentieth that spent on social security and welfare (\$109,049 m).

*Table 1. Selected Government Expenditure by all levels of government 07/08*

	Expenditure (\$m)	% of total
Social security and welfare	109,049	26.5
Health	73,556	17.9
Education	55,571	13.5
General public service	27,968	6.8
Transport and communications	25,795	6.2
Housing and community amenities	21,013	5.1
Public order and safety	20,317	4.9
Defence	18,228	4.4
Recreation and culture	13,634	3.3
Fuel and energy	6,874	1.7
Agriculture	6,411	1.6
Mining, manufacturing and construction	2,851	0.7
Total	411,863	

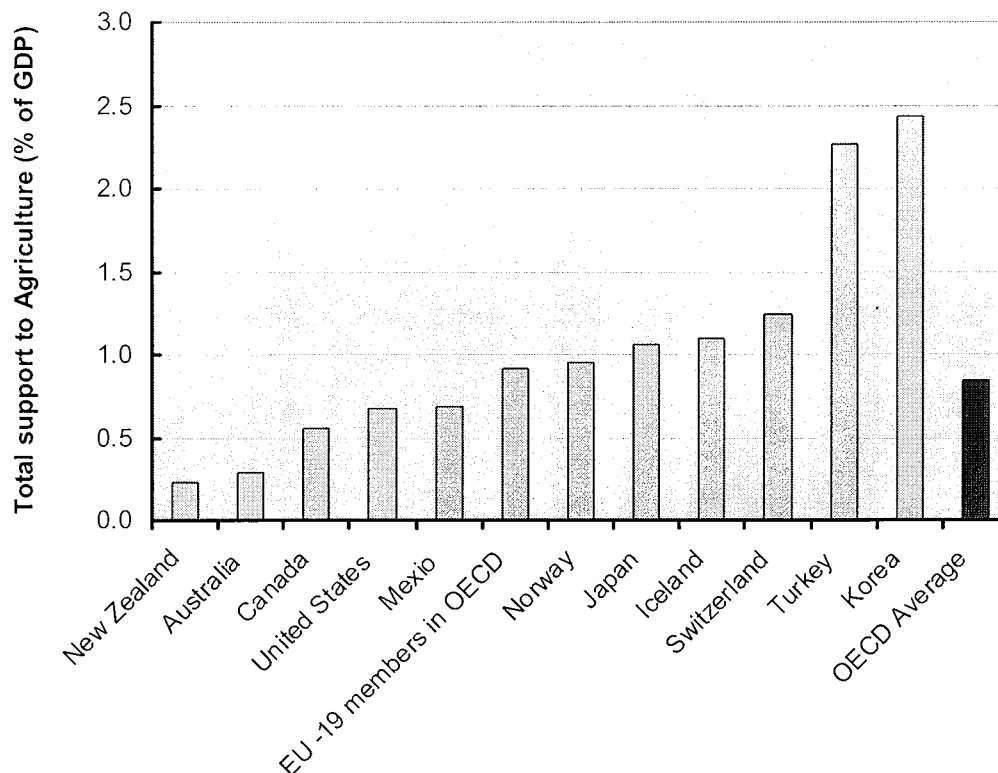
Source: Australian Bureau of Statistics, 5512.0 Government Finance Statistics, Australia, range of years

Government assistance to agriculture in Australia is the second lowest in the OECD after New Zealand with just 0.29 percent of GDP provided in total assistance in 2008 (Figure 1) compared to a nearly three times larger average for the OECD of 0.84% (OECD 2009). Australian government assistance is predominantly in the form of adjustment assistance, drought relief, tax concessions and research and development support.

As such the modest expenditure of Australian governments on R&D is a far cheaper and less distorting approach than that taken by most other nations. In essence Australia has opted for low levels of support to agriculture with some of this support being via Government R&D expenditure.

I&I NSW argues that this is a highly effective approach by the Commonwealth and its partners in rural policy. The current R&D model provides a bundle of industry and public goods ensuring that community priorities (economic, social and environmental) are addressed in a way that result in rapid adoption by industry because of the private industry benefits. As such rural R&D provides an effective substitute for more coercive or distorting approaches.

**Figure 1. Total government support to agriculture as a percentage of GDP.**



Source OECD 2009; StatExtracts 2009 –F-Total Support Estimate by Country

The investment by government in rural research will also have important impacts on rural communities over and above the direct economic and environmental benefits. The improved productivity and sustainability of rural industries is likely to flow into improved profitability and employment not just on farm but more broadly in the region, for example in the agricultural service sector and in food processing. Further, the presence of regional research centres is likely to be important in improving the access of that community to the wider knowledge economy. Rural research that addresses issues such as drought is also likely to contribute to not only making the farms more resilient and less dependant on the welfare system but also the broader regional community. I&I NSW believes that rural research plays an effective role in rural policy and one that is complimentary and in many instances more cost effective than other approaches to rural capacity building.

### 3) To meet moral obligations regarding food security in developing nations

Governments may choose to invest in rural R&D not just to benefit their own industries and citizens but to also meet moral obligations to developing nations. Much of what is thought of as an “industry good” at a national level is likely to be a regional and global public good due to spillovers. Agriculture has been and remains fundamental to society’s survival and development. It is difficult to overstate this and the impact of agricultural innovations on the current world. For example, the United Nations Human Development Report (UNHD 2001) emphasises the role technology has had in dramatically improving human well being with most regions now enjoying

life expectancies of over 60 years. The report attributes this predominantly to medical and agricultural science driven innovations. The report states that:

*“The reduction in undernutrition in south Asia from around 40% in the 1970’s to 23% in 1997 – and the end of chronic famine – was made possible by technological breakthroughs in plant breeding, fertilizers and pesticides in the 1960’s that doubled world cereal yields in just 40 years. That is an astonishingly short period relative to the 1000 years it took English wheat yields to quadruple from 0.5 to 2.0 tonnes per hectare.”*

Nearly all of the research that underpins these achievements has its roots in publicly funded R&D in the developed world. An additional advantage is that investments that contribute to meeting moral obligations to developing nations are also likely to contribute to regional and global stability and security.

4) *To address other forms of market failure – Reducing negative externalities from the use of the natural resource base*

The estimated total area of Australia devoted to agricultural activity (excluding forestry) is 417.3 million hectares, representing about 54% of the total land area (ABS 2009 -7121). Similarly agriculture accounts for about 75% of all surface water diversions (NLWRA 2000) and primary industries activities have wide ranging impacts on native vegetation, biodiversity, water and air quality and greenhouse gas emissions. As such primary industries are extremely important to the management of natural resources in Australia. Rural R&D can be used to develop sustainable systems capable of generating profit and jobs at the same time as protecting the natural resource base. Industry has limited incentives to do both. The advantage of investment in rural R&D is that it can simultaneously achieve both outcomes.

Table 2. Surface area of Australia managed by agriculture (excludes forests)

State	Total (m ha)	Agriculture (m ha)	% agricultural land
WA	252.988	93.035	37
Qld	173.065	141.058	82
NT	134.913	63.888	47
SA	93.348	47.076	50
NSW	80.064	51.118	64
Vic	22.742	12.536	55
Tas	6.840	1.542	23
ACT	0.236	0.037	16
<b>Australia</b>	<b>769.202</b>	<b>417.288</b>	<b>54</b>

Source ABS 2009 – cat 7121, agricultural commodities Australia

5) *For policy support eg government requires information in order to frame policy*

As Australian primary industries and the broader community face increasing challenges into the future including climate change, and issues of food and water security, the need for sound information on which to develop policy is likely to increase. Government is fully justified in investing in rural R&D to fill critical knowledge gaps.

### ***Limitations to using industry versus public benefits as a basis of government funding***

A naïve application of a binary industry versus public benefits model as the determination of government funding in rural R&D could well have unintended consequences.

In reality the vast majority of projects conducted by state primary industry agencies such as I&I NSW including those jointly undertaken with RDCs provide a tight mix of both public and industry goods (Mullen and Crean 2006, Mullen and Crean 2007). Further, an overly doctrinaire approach to industry versus public benefits fails to appreciate that over time the benefits from projects with a strong industry focus can ultimately lead to very significant public goods. For example, I&I NSW has been involved in net feed efficiency research in beef cattle over a long period of time. This work was initially focused on raising productivity in the beef industry but the outcomes of the research are now likely to play a key role in reducing greenhouse emissions from livestock (case study 1)

An attempt to develop separate funding models for industry projects compared to public benefit projects may result in an overall underinvestment in public outcomes.

A further weakness of applying an overly simplistic beneficiary-pays model is that current assessments seem to be focused entirely on economic benefits without taking into account the admittedly difficult-to-measure environmental and social benefits of rural research.

Rural R&D is likely to have a wide range of important environmental benefits, such as improved air, soil and water quality. Likewise, consumers receive significant benefits, such as access to inexpensive, safe, food and fibre products and increased incomes and employment. In addition, the community benefits from a greater stock of scientific knowledge and skill, an ability to respond to pest and disease incursions, reduced risks to human health from improved food safety and reduced risks from pests, diseases and the chemicals used to control them. It has been estimated that the environmental and community benefits of rural R&D are at least equal to the industry benefits (Pardey and Alston 1995).

A 2005 analysis of the beneficiaries of research into (and commercialisation of) Roundup Ready soybeans illustrates how the benefits of research can be shared along the supply chain. Qaim and Traxler (2005) found that in 2001 this new soybean seed generated more than \$US1.2 billion in economic surplus globally. It was estimated that agricultural producers gained only 13 per cent of this surplus. The study found the main beneficiaries were consumers, who gained 53 per cent, and seed and biotechnology firms, which together gained 34 per cent. In highly competitive world commodity markets, like agriculture, this result is not surprising. It is questionable whether a benefit in the order of 13 per cent would be sufficient for industry based RDCs to justify investing in similar types of research without government financial support.

The balance of industry and public benefits is only one criterion amongst many that needs to be considered in assessing government funding levels for rural R&D.

## CASE STUDY 1

### **Net Feed Efficiency: State and Commonwealth Governments in partnership with industry deliver benefits to industry, consumers and the environment**

Feeding cattle is a major cost of beef production. In southern Australia, beef cows and their progeny are generally run on improved pastures until they are either sold direct for slaughter or as store cattle for subsequent finishing on pasture, or in feedlots. The cost of developing and maintaining improved pasture ranges between \$7.50 and \$12.86 /Dry Sheep Equivalent/year depending on area sown and stocking rate. In a typical enterprise targeting the domestic supermarket trade, the lower estimate means that 60% of the variable costs of production are related to feed cost. Supplementary feeding with hay, grain and silage is often necessary to fill feed gaps for cows on pasture and to ensure young cattle grow to specification. Such supplementation adds further to the cost of feeding cattle. Further, the cost of feed accounts for 70% of the variable cost of operating a feedlot.

Net feed efficiency (NFE) refers to the difference between an animal's actual feed intake and its expected feed requirements for maintenance and a particular growth rate. Genetic selection for improved feed efficiency aims to reduce feed-related costs and thereby improve profitability.

I&I NSW (as the then NSW Agriculture) commenced R&D in this area in the early 1990s, with a major project jointly funded with the Meat Research Corporation (now Meat and Livestock Australia) . Since then, NFE has been part of the research program of the Cooperative Research Centre for the Cattle and Beef Industry (CRC I) and the Cooperative Research Centre for Cattle and Meat Quality (CRC II). Recently, research has commenced on the relationship between NFE cattle and their outputs of greenhouse gas (GHG), where the experimental work has focussed on evaluating breeding for NFE as a GHG abatement strategy.

The outcomes of this R&D and extension can be grouped as economic, environmental and social.

- *Economic.* The total estimated benefits from the adoption of the NFE technology were calculated to be \$158.0 million over the period 2003-2020 (an aggregate value of \$128.6 million for the cow-calf component of the southern herd and \$29.4 million for the feedlot sector).
- *Environmental.* In addition, the NFE technology has some quite positive potential environmental outcomes. If a cattle producer introduces genetics with superior NFE, then over time the herd will require less feed to maintain the same herd size and farm income. This may result in a lower stocking rate and may provide some environmental benefits to the farm in terms of better ground cover, greater water holding capability and less grazing pressure on preferred pasture species. More promising though is the potential reduction in Greenhouse Gas (GHG) emissions from more feed efficient cattle and increased sequestration of carbon in soils from better pasture management. Selecting for NFE will reduce GHG.
- *Social.* Social outcomes from the R&D in this area of work are more difficult to identify. Because the technology has been developed in Australia, the beef industry will be less dependent on imported genetics. This may result in more vibrant breed societies, industry organisations and more stable and vibrant rural communities.

Genetics has opened up a whole new avenue of possibilities but the benefit of this new technology (genetics) was accelerated by the knowledge stock acquired over a 40 year period. Profitability is one outcome; public benefit the other.

The more significant aspect of long-term research of this kind is that it provides a knowledge stock and options that future generations may benefit from in ways we can not yet imagine.

### **Limitations to using basic versus applied research as a basis of government funding**

A further naïve assumption sometimes made is that there are stronger public good reasons to invest in basic research as opposed to the often more applied nature of Rural R&D. Block and Keller (2008) argue the distinction between basic and applied research is perhaps more illusory than real:

*"It is becoming increasingly difficult to invent something without first developing the scientific basis for the invention, and it is also difficult to go from science to innovation without substantial 'proof of concept' and supporting 'generic' or 'platform technologies'. In computer science, for example, figuring out how to get more microchips on a chip is both a basic and applied problem."*

Given the interrelatedness of the science system a country is likely to need government investment in both basic and applied research.

Pisano and Shih (2009) argue that competitiveness has been hampered in the US by the relative withdrawal of government funding from applied research despite the maintenance of basic research support. They point to the key role government funded applied research has had in computer chip development, composite materials, global positioning systems and perhaps most significantly in the development of the internet.

The appropriate balance between applied and more basic research has received limited direct attention in the Australian agriculture policy literature. Pannell (1999) examined the optimum allocation using a modelling approach and concluded that a diversified portfolio was the appropriate approach. The precise allocation was not critical (the optimum amount identified was in the order of 30% to basic research of the total portfolio of investment) as long as the portfolio was diversified (Pannell 1999). This is consistent with the view that both basic and applied research are important to a nation with a significant investment in applied research often triggering basic discoveries and supplying significant public goods which justify government involvement (Rosenberg 1990). Pannell (1999) argues that agricultural science has unusually close links between basic and applied research and that this might explain why the agricultural research system in Australia shows such consistently strong returns.

The RDC model in Australia has resulted in an investment of about 30% in strategic research, with about 38% in applied research and 33% in experimental development (RDC 2008). This compares to only 3.8 % investment in strategic research by non-agriculture business R&D (RDC 2008). This suggests that the government contribution to the Australian RDC model has been successful in maintaining a diversified portfolio compared to what is likely to occur under an industry-only investment regime. Farmers, in the absence of significant funding from government, would be much less likely to make such a significant investment in strategic research.

### **IS THE RDC MODEL FUNDAMENTALLY SOUND?**

The Commission's issue paper (2010) notes that the RDC model is widely considered to have served Australia well in the past but that there is a need to examine if it remains the most appropriate model to meet the challenges of the future.

I&I NSW strongly believes that the model remains fundamentally sound and that the features that have made it effective in the past - particularly its ability to attract co-investment from the States, Commonwealth and industry and its ability to provide a balanced portfolio of both applied and strategic, industry and public and

near-term and long-term research – will be critical to helping the sector and the broader community face key challenges into the future.

### ***Overarching issues***

The past effectiveness of the rural RD&E system in Australia is attested by many empirical studies and these appear to be acknowledged by the Commission (PC 2010). It is important to note that, despite the many caveats that are required around empirical return on investment studies, the evidence for high returns for agriculture research appears to be clearer than for most other sectors of the economy.

In NSW, Mullen (2007) estimated that almost half of the value of agricultural output can be attributed to new technology generated by domestic research since 1953 and that the compound value of the stream of benefits from this domestic R&D is \$878 billion in 2004 dollars (Mullen 2007). These benefits are shared by producers, processors and consumers. The Productivity Commission (PC 2005 p xl) in summarising empirical evidence of this nature concluded that *“a key source of productivity growth in agriculture has been the generation and adoption of new knowledge or technologies”*.

Clearly, given their size the RDCs have played an important role in this. In an evaluation of 32 randomly selected projects from the RDC portfolio it has been estimated that an average return of \$11 is generated for each dollar invested in 2007 dollars (RDC 2008).

As argued earlier I&I NSW believes there are strong rationales for government investment in rural research. It is clear that without dollar for dollar matching that many significant issues such as: dealing with carbon; water use efficiency; nutrient use efficiency; and, sustainability issues would be underinvested in by private enterprise or SMEs / farms. It cannot be assumed that Australia's array of agricultural industries mostly competing on heavily subsidised world markets can simply find another way to fund much of the critical work required and at the same time attract and hold suitable researchers especially in regional areas. The current R&D model provides a very efficient and focused process for ensuring productivity and sustainability go hand in hand. Without the current model there will undoubtedly be major holes appearing in the research agendas and the potential for huge inefficiencies in the commissioning, management and extension / adoption of research.

While there is no doubt room to improve (see later section) a fundamentally different model would have to present a compelling case as to how it would be more effective.

In terms of some of the overarching issues raised by the Commission, I&I NSW does not regard the significant number of entities and funding pools in the Australian rural R&D framework as a weakness but rather as a strength that enables a market for ideas to operate rather than an overly centralised system that would tend to inhibit innovation.

Coordination on the whole is sound but there can be gaps particularly in areas that cut across multiple RDCs. It is I&I NSW's view that three areas where this is currently occurring is in pasture, water and soil research. I&I NSW believes that these issues can and should be addressed via the R&D subcommittee of Primary Industries Ministerial Council (PIMC) and through the Council of Rural Research and Development Corporations Chairs rather than through radical reform to the model.

I&I NSW believes that the current overall rural R&D framework has a high degree of flexibility which has enabled the system to rapidly respond to emerging issues such as climate change.

### ***Specific issues***

The tension between levy payers and the Commonwealth Government noted by the Commission is a reflection that the model does in fact deliver a bundle of industry and public goods and not just private industry benefits. I&I NSW believe this is a key strength of the system and that any tensions in the system can and should be addressed by improved governance arrangements, particularly in relation to natural resource and environmental matters.

I&I NSW believes that the dollar for dollar matching of levies is a key strength of the system that as discussed earlier results in a more balanced portfolio of R&D. In addition, the RDCs provide cash into the system, which leverages investment from other research organisations such as State DPI's and universities. Removing or reducing the RDC cash will create a multiplier reduction in R&D effort. Further, the role of RDC cash in enabling the formation of CRCs is often overlooked. CRCs have been extremely important in creating collaboration, reducing overlap and providing stability of purpose. The RDC cash has been critical in bringing many CRC's together. No cash, no collaboration! Further, the RDC input has frequently provided the industry input and focus to ensure relevance and uptake. I&I NSW believes the role of RDC cash in creating agricultural CRCs and making them successful has been underestimated in previous reviews of the CRC program. It is worth noting that while CRCs have been an important addition to the rural innovation system that they have rarely been as effective as the RDCs in generating a well focused and balanced portfolio of research.

The issue of merging RDCs is a complex one. It is essentially a trade off between optimising administration and other overhead costs and the possible loss of focus that will result from having many industries around the board all advocating their own priorities. On balance I&I NSW believes that RDCs should not be centralised into one mega agency as it would distance priority setting and decision making from industry and reduce industry ownership of the model.

The Commission could consider the value of RDC Boards having a significant Government Member on them who can make decisions and make comment on government related matters.

### **FUNDING LEVEL ISSUES**

The Cutler (2008) review notes that a strong research sector is an underlying requirement for Australia's productivity and economic growth and that the ongoing reduction in government support for the public research system is out of step with most other OECD economies. Cutler also identified that "We must also ensure that our most globally competitive industries, such as mining, agriculture, education and tourism receive adequate research funding support to keep them at the cutting edge."

Public expenditure on agricultural R&D increased steadily in real terms up until the mid-1970's and has remained more or less static in real terms since (Mullen and Crean 2007). Data on agricultural R&D (excluding fisheries and forestry) indicates that public investment in agricultural research has been stagnant in real terms since the 1970s, peaking in 2001 at about \$800 million before falling to \$700 million in 2005 (Mullen 2007; ABS 2007b – 8112.0). Public expenditure represents about 75% of the total expenditure with just over \$1.2 billion out of a total of about \$1.4 billion in 2006-07 (ABS, cat 8112.0 multiple years). Despite the decline in state expenditure in agricultural research (ABS, cat 8112.0 multiple years) the states continue to remain the largest funder of these activities. This in part reflects their constitutional responsibilities and regional needs and interests. The state organisations have also traditionally had significant extension services for transferring research information to industry.

It is hard to suggest benchmarks for overall levels of funding except to suggest that current levels need to be maintained or increased as indicated by:

- 1) the correlation between reduced government spending in agricultural R&D and the decline in agricultural productivity growth (Alston et al 2010 and Sheng, Mullen and Zhao 2010); and,
- 2) The absence of evidence of declining rates of return, which has lead Mullen (2007) to conclude that *“every effort should be made to preserve the current rate of investment, irrespective of how the ongoing debate about the extent of public funding is resolved.”*

## IMPROVING THE RDC MODEL

### *Coordinating point for natural resource research*

The most significant issue facing the model is the loss of a coordinating point for natural resource research after the removal of Land and Water Australia.

There is a range of options to ensure that the predominantly public benefit issues associated with natural resource management are adequately addressed. These include:

- a formal requirement for all RDCs to expend a stated proportion of their government derived funds on public benefit outcomes, including NRM issues;
- making a proportion of Commonwealth funds contestable between RDCs and focussed on NRM outcomes;
- the establishment of a new RDC with an explicit NRM focus.

In all of the above options a broader remit than the former LWA should be pursued, including climate change, native vegetation and biodiversity issues in terrestrial and aquatic environments, in addition to soil and water management.

Each of the options above has advantages and disadvantages. The establishment of an NRM-specific RDC would bring the focus required to address the full range of NRM public benefit outcomes. There would be a focus on the development of appropriate methodologies to evaluate NRM outcomes that has not been particularly well done by the industry-specific RDCs in the past. Alternatively, addressing these issues through existing RDCs would facilitate the simultaneous achievement of both production and NRM outcomes within projects, with the advantage of a likely higher rate of industry acceptance and adoption.

Separating the two is likely to lead industry based RDCs to focus more strongly on solutions with industry benefits, while the NRM RDC could struggle for industry relevance. However, addressing these issues from within industry based RDCs may require the establishment of a CRC or national research centre (involving those CRCs) to develop methodologies and strategies that transcend each individual RDC. This could be time constrained – as with all CRCs rather than being open ended.

I&I NSW favours the option of embedding NRM outcomes within industry RDCs, but with a time constrained CRC or national research facility involving not only RDCs but state agencies, universities and the CSIRO. Its focus would be on climate change, native vegetation, biodiversity, soil and water.

In the fisheries sector, the Commonwealth government recognises the large public-good nature of fisheries-related R&D because all wild caught fish by commercial and recreational fishers (as well as the aquatic ecosystems on which they depend) are publicly owned. This recognition is manifested as an additional contribution by the government that is double the usual dollar-for-dollar, government/industry contribution provided in the agriculture-based corporations. In this area attention needs to be given to ensuring that the distribution of investment directed to public good outcomes is not purely proportional to where levies are collected but rather to the strategic nature and size of a problem.

### ***Improved governance***

I&I NSW also believe there are significant opportunities to enhance governance arrangements within Australia's RDCs. The weakness currently in the system is not so much that there is a lack of synergy between the research needs of the agriculture sector and the Government's public policy priorities but perhaps limited resources from the Commonwealth to enable it to ensure that its priorities are being implemented.

Of particular concern to I&I NSW is the potential for peripheral activities to be undertaken by RDCs that result in reduced funding for true R&D. While activities such as product promotion; consumer research; industry development officers; and industry associations may be legitimate, funding for these activities needs to be transparent and not result in the dilution of funding of R&D where more far-reaching public benefits are likely to be achieved. It is also of concern that some RDCs see research co-investors such as state departments as "providers" rather than co-investors. This may result in the RDCs not having a strong enough focus on investing in such a way that not only provides public and industry outcomes but also maintains a strong R&D skills base in Australia.

I&I NSW believes (i) that boards should be skills-based, not popularly elected, and (ii) that funding agreement between DAFF and RDCs should be used more forcefully to impose governance requirements and to induce the NRM focus of research that may be necessary. This is better, as argued earlier, than allowing the NRM work to be split off and handled separately. The RDCs could consider reverting to the practice of putting a Government member on the board of industry corporations. The establishment of a small oversight/evaluation group with an appropriate balance of both science management and economic skills outside of the RDCs either within or outside of the Commonwealth Department of Agriculture, Fisheries and Forestry (DAFF) could also be considered to enable the Commonwealth to improve governance and assist in evaluating the achievement of RDCs and their future investment plans.

### ***Regional distribution of levies***

It seems that regions or states that "do best" are ones with a small number of nationally dominant industries – and not necessarily where there are large populations. The current methods of distribution predisposes to underinvestment in states (like NSW) where there is a very diverse industry base but a very large public. This can cost the Commonwealth government in the relative amount of public exposure of their R&D investments. Some evaluation of regional distribution of levies and benefits could be attempted.

## **CONCLUSION**

The current RDC model for rural research and development based on a mixture of industry levies and government (both state and Commonwealth) contributions has served Australia well and represents a relatively modest public investment (eg., government expenditure on all agricultural issues represents about 1.6% of total government expenditure and research is only a small proportion of this) that sees Australian agriculture with the second lowest level of government support in the OECD. Agricultural R&D provides government and the community with a "clever" way to deliver a mixture of industry and public benefits that is likely to be more

effective and less distorting than more coercive approaches such as increased regulation or subsidies. Government investment should be maintained particularly as broader Australian productivity appears to be stalling.

## REFERENCES

- Abramovitz, M. (1986). 'Catching Up, Forging Ahead, and Falling Behind'. *Journal of Economic History*, 46:2, pp. 385-406.
- Australian Bureau of Statistics (2007b). *Research, Experimental Development, All-Sector- Summary, Australia*. Cat. No. 8112.0, ABS, Canberra.
- Australian Bureau of Statistics (various). *Research, Experimental Development, All-Sector- Summary, Australia*. Cat. No. 8112.0, ABS, Canberra.
- Australian Bureau of Statistics. (2009). *Agricultural Commodities, Australia, 2007-08*. Cat. No. 7121.0, ABS, Canberra.
- Alston, J.M., and Pardey, P.G. (1996). *Making Science Pay: The Economics of Agricultural R&D Policy*. Washington, DC: The American Enterprise Institute Press.
- Alston, J.M., Andersen, M., James, J., and Pardey, P. (2010). *Persistence Pays: US Agricultural Productivity Growth and the Benefits from Public R&D Spending*, Springer, New York.
- Block, F., and Keller, M.R. (2008). *Where Do Innovations Come From? Transformations in the U.S. National Innovation System, 1970-2006*. The Information Technology & Innovation Foundation.
- Cohen, W.M., and D.A. Levinthal. (1990). 'Absorptive capacity: A new perspective on learning and innovation.' *Administrative Science Quarterly* 35(1), 128-152.
- Cutler & Company. (2008). *Venturous Australia: building strength in innovation*, Department of Innovation, Industry, Science and Research, Canberra.
- Dowrick, S. (2003). *A Review of the evidence on science, R&D and productivity*, prepared for the Department of Education Science and Training, Commonwealth of Australia, Canberra.
- Mullen, J.D., and Crean, J. (2006). 'Strong agricultural productivity growth despite weaker public R&D investment: Does this make sense?' *Farm Policy Journal*, Vol 3., No.1, pp 11-23.
- Mullen, J.D., and Crean, J. (2007). *Productivity Growth in Australian Agriculture: Trends, Sources and Performance*, Research Report, Australian Farm Institute, Surry Hills, Australia.
- Mullen, J.D. (2007). 'Productivity growth and the returns from public investment in R&D in Australian broadacre agriculture'. *The Australian Journal of Agricultural and Resource Economics*, 51, pp. 359-384.
- Nelson, R., and Nelson, K. (2002). 'Technology, institutions and innovation systems.' *Research Policy* 31, 265-272.
- Nelson, R., and Phelps, E. (1966). *Investment in humans, technological diffusion, and economic growth*. *American Economic Review: Papers and Proceedings* 51 (2), 69-75.
- NLWRA (2000). *Australian Water Resources Assessment 2000*. National Land & Water Resources Audit, Commonwealth of Australia, Canberra.
- OECD. (2009). *-f- total support estimate by country*. Organisation for Economic Co-Operation and Development.

- Pannell, D.J. (1999). 'On the estimation of on-farm benefits of agricultural research', *Agricultural Systems* 61(2): 123-134
- Pisano, G.P., and Shih, W.C. (2009). 'Restoring American Competitiveness'. *Harvard Business Review* 87, nos. 7-8 (July - August 2009).
- Productivity Commission. (2005). *Trends in Australian agriculture*, Commonwealth of Australia, Canberra.
- Productivity Commission (2007). *Public Support for Science and Innovation: Productivity Commission Research Report*, Commonwealth of Australia, Canberra.
- Productivity Commission (2010). *Issues Paper - Rural Research and Development Corporations*, Commonwealth of Australia, Canberra.
- Qaim, M., and Traxler, G. (2005). 'Roundup Ready Soybeans in Argentina: Farm Level and Aggregate Welfare Effects'. *Agricultural Economics*, Vol. 32, No. 1, pp. 73-86.
- Rosenberg, N. (1990). Why do firms do basic research (with their own money)? *Research Policy* 19, 165–174.
- 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, February 2010.
- Rural Research and Development Corporations. (2008). *Measuring economic, environmental and social returns from Rural Research and Development Corporations' investment*. Rural Research and Development Corporations Council.
- I&I NSW (2010). *The Contribution of Primary Industries to the NSW Economy, Key Data 2010*.
- United Nations Human Development Report (2001). *Making new technologies work for human development*. Published for the United Nations Development Programme (UNDP) New York Oxford University Press 2001.