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

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## The Victorian Farmers Federation

The Victorian Farmers Federation (VFF), Australia's largest state farmer organisation and the only recognised, consistent voice on issues affecting rural Victoria. Victoria is home to 25 per cent of the nations' farms. They attract neither government export subsidies nor tariff support.

Despite farming on only three percent of Australia's available agricultural land, Victorian's produce 30 per cent of the nation's agricultural product. The VFF represents the interests of our State's dairy, livestock, grains, horticulture, chicken meat, pigs and egg producers.

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## Introduction

The Victorian Farmers Federation believes that the current R&D model for rural research and development has produced excellent results in driving agricultural productivity, environmental outcomes and has provided significant community benefit that justifies the Government contribution. The impressive growth in agricultural productivity growth of 2.8 per cent per annum over recent years has been achieved on the back of this investment model.

The productivity growth in countries at similar stages of agricultural technology Canada and the US are not able to report the same level of gains. Agricultural productivity in Canada grew by 0.6 per cent per annum from 1961 to 2005.[1] In the period 1977 to 2000 US agricultural productivity grew by a better, but not Australian level, of 1.9 per cent. Both the US and Canada have agricultural structures not unlike those typical of Australia. The majority of farms being family owned and operated with relatively sophisticated production and supply chain systems. Both the US and Canada also have well developed agricultural R&D systems that are supported by public funding. Unlike Australia, however there are not the strong institutional linkages between producer and public R&D funding contributions.

## The Australian System

The Rural R&D system of compulsory levy with matching funds provided by the Government up to the an amount equivalent to 0.05 per cent of industry value facilitates a cooperative and shared responsibility approach between Government and industry. The funding arrangements of producer and government contribution provides an incentive for industry contributions to be maintained and minimises the problems seen in R&D funding where it is difficult for private investors to capture the benefits. It is also an appropriate method for public contributions to be made for the 'community good' benefits of agriculture R&D that are being achieved.

This leads to a higher investment than would otherwise be the case. The evidence of the returns being achieved as reported in the Rural R&D Corporations report of $10.51 being returned for each dollar invested[2], suggests that there is not over investment in rural R&D.

## Spillover Effects

The distributions of these returns are not specific to farmers. A number of studies have found that the spillover effects agricultural R&D are substantial. Using different methodologies in measuring the R&D stocks or covering different products, the analysts have reached an agreement in that social returns to investments in agricultural research are high.[3]

> *The partial public-good nature of much of the knowledge produced by research means that research benefits are not fully privately appropriable. Indeed, the main reason for private sector underinvestment in agricultural R&D is inappropriability of some research benefits: the firm responsible for developing a technology may not be able to capture (that is, appropriate) all of the benefits accruing to the innovation, often because fully effective*

[1] Veeman, TS. & Gray, R. (2009) Agricultural Production and Productivity in Canada: Choices 4th Quarter 24 (4)
[2] Council of Rural Research and Development Corporation Chairs (2010) Impact of Investments in Research and Development by the Rural Research and Development Corporations.
[3] Sun,L et al (2008) Impact of Public Goods on Agricultural Productivity Growth in the US;

*patenting or secrecy is not possible or because some research benefits (or costs) accrue to people other than those who use the results.*[4]

*Putting aside the question of quantum, the rationale of public support for rural research is well grounded. There is a broader economy wide agenda to foster productivity growth and, in the case of rural industries, research generates substantial spillover benefits to the broader community.*[5]

As the Productivity Commission Issues Paper concedes, there is wide spread agreement that R&D can provide significant economic benefits and that reviews of rural R&D have found considerable payoffs for past investments. The Commission raises the question as to whether the continued investment should be based on the benefits achieved from past investments. The VFF suggests that the converse could also be asked; is there evidence that future investment will not provide significant returns to the Australian and world community? It would seem that from the challenges the world face with a world population increasing at an substantial rate and increasing pressure on the worlds natural stocks that there is a high likelihood that continued investment will provide a greater public benefit then investments of the past. The prospect of a 'malthusian nightmare' is not unthinkable.

## Increasing Demand for Food

The world's population is expected to reach 9.2 billion by 2050 compared to a current population of 6.8 billion; a rise of 35 per cent. Growing economies and increasing affluence in some developing nations, particularly China and India, will see increasing food consumption per person and a shift towards a higher protein diet.

This increasing demand for food will require substantial increases in production. The area available to produce food is relatively fixed in the advanced food producing nations so the pressure will be to increase the productivity of each land unit. While there remains substantial undeveloped land in many nations the environmental damage of a continual expansion of land cleared for food production is undesirable. The avenue for gains for increased land productivity is through investments in R&D.

*"The initiatives required to raise the global food supply in the medium to long term are clear, and need to be implemented across the world. A key initiative is greater investment in public and privately funded research and development specific to the needs of the most vulnerable countries. Specifically, research committed to developing more drought tolerant crops for arid climates is necessary, as climate change poses a significant threat to agriculture and water supplies globally.*[6]"

World fish stocks are also under threat. The United Nations Headquarters warns that three quarters of the world's fish stocks are in distress and nearing depletion while marine ecosystems continue to deteriorate. With fish accounting for 16 per cent of the world's animal protein, the ability to increase fish catch proportionally to population growth is unlikely. This will place a proportionally higher reliance on land based agriculture to meet world food demands.

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[4] Pardey, p. &Alston, J (2010) US Agriculture Research in a Global Setting; A Report of the CSIS Food Security Project: Washington

[5] Core, P. (2009) A Retrospective on Rural R&D in Australia: Australian Government Department of Agriculture Fisheries and Forestry

[6] Sheales,T. & Gunning-Trant, C (2009) Global Food Security and Australia: ABARE. Issues Insights 9.8.

Growth in supply of agricultural commodities is primarily driven by growth in productivity, especially as growth in the availability of land and water resources for agriculture has become more constrained. Productivity improvements in agriculture are strongly associated with lagged R&D spending, as revealed in a large compilation of country-specific studies reported in Alston et al. (2000). Thus, the rate of growth of investments in agricultural R&D and the uses to which those research dollars are put will be a pivotal determinant of long-term growth in the supply, availability, and price of food over the coming decades.[7]

While the benefits to the Australian community are not direct, building the capacity of Australian farmers to assist in meeting increased world food demand is a positive spillover effect. Placing a value on this spillover is not simple; however as an indication of the value the Australian community places on assisting other countries the AusAid program will deliver $3.8 billion in overseas aid in 2009-10[8]. While this aid is not targeted at food supplies it does indicate that assisting poorer nations develop does have a value to the Australian community. It would be difficult to argue that ensuring sufficient food is available to reduce hunger in developing nations is not valued by the community or is beyond Australia's obligations to the wider world.

## Environmental Benefits

The production and harvesting of food cannot be carried out without some cost being imposed upon the environment. This phenomena is not restricted to modern farming techniques or to humans. The harvest of non farmed food sources, such as fishing, is impacting on the environment. There are also many examples of animal populations increasing to a level that causes significant environmental degradation. The responsibility of modern societies is to produce food in a manner that is sustainable and as benign as possible given the other demands that are placed on production.

The consumers of today expect to be provided with abundant choices of high quality food at as low prices as possible. While there is a market, albeit small in comparison to total food production, for organic produce which is claimed to be less damaging to the environment, the average consumer appears unwilling to pay the premium demanded for these foods. In the US only 0.7 per cent of cropland and 0.5 per cent of pasture is certified organic.[9] A report prepared by the Department of Agriculture Fisheries and Forestry in 2003 estimated that the farm gate value of organic produce in Australia was $140 million. This is less than half of one per cent of total production of $34 billion.

This is simply used as an example of consumers' willingness to pay for the environmental costs of food production and is not dismissive of the growth being experienced in niche markets such as organic produce.

While there is no active market to price environmental costs from the food we eat this does not mean that it is not valued; or that reducing the environmental footprint of the food produced is a benefit to the Australian society. However, if there is no, or at best a limited market for reducing the environmental footprint of the food consumed in our society, the market signals to private investors into research that has environmental objectives are weak. This would suggest that

[7] Pardey, p. &Alston, J (2010) US Agriculture Research in a Global Setting; A Report of the CSIS Food Security Project: Washington
[8] http://www.ausaid.gov.au/makediff/default.cfm
[9] UnitedStates Department of Agriculture

without intervention, investment in research with environmental objectives would be less than that desired by society.

The investment into R&D for productivity gains by its nature tends to have a positive impact on environmental outcomes as well. The understanding of eco-systems and the systemic nature of food production technologies interactions with the environment has increased substantially and is better considered in R&D. Farmers are in general also much more aware of the need for, and the factors leading to more sustainable systems.

There are simple examples where this is evident such as the development and adoption of minimum or no till cropping. The problems associated with fallow based farming systems are well known. Soil erosion impacting the production landscape and substantial dust storms impacting in urban areas. Despite years of well below average rainfall in northern Victoria there has not been a repeat of the dust storm that hit Victoria in 1983. The Bureau of Meteorology described the storm as;

> *"At its height, the dust-storm extended across the entire width of Victoria, and was many kilometres across. The dust-cloud was some 320m deep when it struck Melbourne, but in other areas extended thousands of metres into the atmosphere. It was estimated that about 50,000 tonnes of topsoil were stripped from the Mallee (approximately 1,000 tonnes of it being dumped on the city), leaving the ground bare, and exacerbating the effects of the drought. Open water channels in the northwest were clogged with sand and dirt. The combined effect of drought and dust-storm inflicted damage on the land that, according to the then President of the Victorian Farmers and Graziers' Association, would take up to 10 years and tens of millions of dollars to repair*.[10] "

The minimum tillage system was driven by and enabled by a number of factors and not purely as a response to problems with soil erosion. The development of chemicals able to more effectively controls weeds in cropping systems lessened the need for cultivation; the development of tillage equipment able to sow through stubble residue enabled stubbles to be kept to protect the soil; and better crop varieties and moisture retention systems all contributed to the improvement in soil structure and environmental outcomes.

However the need to drive productivity was the main driver of the development in each of the separate component technologies. It was the work in putting the pieces of technology together led to the farming system that is more sustainable. The development of this system has seen spillover effects in better environmental outcomes that have a benefit to the wider community.

Capturing the value of the spillover is difficult and the return on R&D investment reported by the Rural R&D Corporations excludes any dollar value being included for environmental or social outcomes which are being achieved. Productivity gains in agriculture, which by definition improves the efficiency of input usage more often than not results in improved environmental outcomes. Also, the social benefits in rural communities from more productive agriculture and improved environmental outcome also accrue significant value attributable to the R&D effort.

[10] Bureau of Meteorology (2010) The Melbourne Dust Storm of 1983. www.bom.gov.au/lam/climate/levelthree/c20thc/storm7.htm

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## Declines in Productivity Growth

The average rate of productivity gain has slipped somewhat from the very impressive long term average of 2.8 per cent per annum over recent years, however this can largely be attributed to three factors; a series of very poor seasons including prolonged and severe drought; the increasing focus on environmental outcomes rather than pure productivity outcomes and a decline in real R&D spending.

A report prepared by the Australian Bureau of Agriculture and Resource Economics (2009) found that

> *"Despite high returns, there has been a stalling of public R&D expenditure in Australia over the past 30 years (as a share of GDP). Public investment in agriculture R&D has fallen from 5 per cent of agricultural GDP a year between 1978 and 1986 to slightly more than 3 per cent in 2003."*[11]

The linkage between decreasing public funding of agriculture R&D and decreasing productivity gain is not unique to Australia.

> *"Agricultural R&D is at a crossroads. The close of the twentieth century marked changes in policy contexts, fundamental shifts in the scientific basis for agricultural R&D, and shifting funding patterns for agricultural R&D in developed countries. Even though rates of return to agricultural research are demonstrably very high, we have seen a slowdown in spending growth and a diversion of funds away from farm productivity enhancement. Together these trends will contribute to a slowdown in farm productivity growth at a time when the market has, perhaps, begun to signal the beginning of the end of a half-century and more of global agricultural abundance."* [12]

Studies in Canada have also linked a decline in agriculture's productivity growth to a decline in R&D spending and also by directing R&D spending away from improvements in livestock and crop production to other societal priorities such as environmental objectives.[13]

The change in focus to environmental outcomes could affect the growth in productivity that has been, or could be, achieved in the future. This is not to argue that environmental outcomes are of no concern. The farm sector has been able to substantially improve environmental outcomes simply as a function of productivity growth. Another factor to consider is that research shows that when farms are profitable the level of spending on environmental works increases. Therefore focusing on productivity provides benefits in production efficiency leading to better environmental outcomes as well as improving potential profitability which results in increased spending on environmental works.

The long term importance of R&D funding is highlighted in a study of 65 countries that showed that the countries that invested most in the R&D and concluded that '*These results suggest that,*

[11] Nossal K. and Gooday P. (2009) Raising Productivity Growth in Australian Agriculture: ABARE
[12] Pardey, p. &Alston, J (2010) US Agriculture Research in a Global Setting; A Report of the CSIS Food Security Project: Washington
[13] Veeman, TS. & Gray, R. (2009) Agricultural Production and Productivity in Canada: Choices 4th Quarter 24 (4)

*on average, those countries making the most effort in the R&D sector will be more productive in the future.'* [14]

## Assessing Performance

While substantial effort has been applied to evaluating the return on the R&D effort an accurate accounting of all the benefits stemming from R&D is yet to be obtained. While an estimate of reasonable accuracy for the direct benefits for the agriculture industry has been defined, $10.51 for each dollar spent as reported earlier, an assessment that is able to provide a reasonable capture of the spillover benefits or even the long term direct benefits from rural R&D is yet to be devised.

The problems associated with capturing the spillover benefits by increasing productivity to meet growing world food demands and improved environmental outcomes has been covered earlier. Other factors are also at play in measuring direct benefits to agriculture and the distribution of the benefits.

Farming is a production system where it is usual for different technological developments to be amalgamated to enable a system change in food production that has productivity and other benefits. The example of minimum tillage systems was used earlier to illustrate this point. There is difficulty in providing an accurate assessment of R&D outcomes where this individual and unrelated technological developments are combined to create a new innovative farming systems of which the benefits both to the individual and the wider community may be much greater than the sum of benefits provided by each of the constituent developments.

The time lags involved from R&D to a full realisation of the benefits can be many years. It may take other innovations to be refined before the outcome of an R&D project can be fully utilised; again think of the minimum till example and how is was a number of elements coming together that enables wide spread successful adoption of the system.

The nature of agriculture also tends to lead to developments taking significant time between inception, wide spread adoption and a full understanding of the implication of the systems. Farming, is in part an application of management techniques to biological systems. The complexities of soil types, plant species, soil biota, weather conditions and the production animal are just some of the many interactions that will shape the outcome for any particular development. The nature of the factors and the way they interact can vary from country to country, state to state even from paddock to paddock. Attempting to predict the full quantum of these variations at inception of innovation is difficult but over time the value can be assessed.

A US study articulates these points.

> *The results show that the time lags between R&D spending and its effects on productivity are longer than commonly found or assumed in the prior published work. Also, the spillover effects of R&D among states are important, such that the national net benefits from a state's agricultural research investments are much greater than own-state net benefits. The main findings are consistent across a wide range of reasonable model specifications. In sum, the benefits from past public investments in agricultural research have been worth many times*

[14] Ortego, C. & Marin, A. (2008) Exploring teh Relationship BetweenR&D and Productivity: A Country Level Study. University of Chile

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*more than the costs, a significant share of the benefits accrue as spillovers, and the research lags are very long. An accelerated investment in public agricultural R&D is warranted by the high returns to the nation, and may be necessary to revitalize U.S. agricultural productivity growth even though the benefits may not be visible for many years.*[15]

There is little doubt that accurately assessing the value from rural R&D is fraught with complexities and difficulties. The assessment that have been used to date show a positive return not only for investors but for the wider community. This seems common across nations with advanced agriculture production systems.

The main problems are in

- capturing the full benefits of innovations that enable or become a part of a farming system that has positive outcomes.
- dealing with time lags between innovation and adoption or incorporation with other innovations.
- capturing the benefits of spillovers.

These issues are unlikely to be resolved to the point where a full and complete assessment of all the benefits from a particular R&D effort are able to be measured and attributed. Measuring the relative performance of the rural R&D bodies will enable a more detailed picture of performance to be obtained. That is an assessment system that is as uniform as possible be applied, and each of the rural R&D bodies measured not only on absolute performance but also on relative performance. Incorporating international or other sector R&D efforts of a similar nature into the assessment process may also be helpful in measuring benefits.

Any system applied to measuring the spillovers must be comprehensive so as not to short change the value of rural R&D to the broader Australian community. Further, any system must be focused on long time horizons to address issues such as long term food security, environmental performance and the geography of Australia's population.

## Funding Rural R&D

The current funding methodology for Rural R&D is supported by the VFF in principle. The system of compulsory producer levy and Government contribution has led to strong R&D efforts and substantial benefits to industry and the wider community. This system alleviates some of the inherent problems in R&D , such as spillovers and free rider problems. A US study found

*'..others can "free-ride" on an investment in research, using the results and sharing in the benefits without sharing in the costs. In such cases, private benefits to an investor (or group of investors) are less than the social benefits of the investment, and some socially profitable investment opportunities remain unexploited. The upshot is that, in the absence of government intervention, investment in agricultural research is likely to be too little.'*[16]

[15] Alston, J.M., Andersen, M.A., James, J.S., Pardey, P.G. (2010) Persistence Pays U.S. Agricultural Productivity Growth and the Benefits from Public R&D Spending Natural Resource Management and Policy, Vol. 34.

[16] Pardey, p. &Alston, J (2010) US Agriculture Research in a Global Setting; A Report of the CSIS Food Security Project: Washington

The study goes on to suggest that the Australian Rural R&D funding model is an effective way to deal with the problem.

> *'Arguably the most straightforward approach is to pass enabling legislation that empowers industry to impose a research levy on producers. One way to encourage producers to implement such a scheme is for the government to provide dollar-for-dollar matching of levy funds up to some predetermined limit (say 0.5 or 1.0 percent) of the gross value of production of the industry. Such a scheme was implemented to good effect in Australia in 1985, and now almost half of all the funding to agricultural R&D performed by public agencies is jointly financed with taxpayer and industry funding using this institutional instrument.'*[17]

The other factor justifying the public investment is the spillovers from Rural R&D on which there appears to be widespread support for suggesting that they are significant although difficult to quantify accurately. Therefore the case for substantial public sector support is solid and the questions becomes more around the quantum and how this support should be managed.

The VFF believes the current public funding to Rural R&D bodies is well justified and given the challenges facing the Australian and world communities in expanding population and environmental pressures and the need to drive productivity growth, that consideration should be given to increase the current cap on Government contributions of 0.05 per cent of industry value.

Providing funds to the Rural R&D bodies provides a more stable R&D capacity than if the government contributions were directed only to those programs that were targeted at public benefit outcomes. As argued previously the intermix between private and public benefit and other spillovers is complex but there is acceptance as to their importance. Reducing funding to the rural R&D bodies would reduce their ability to support the R&D capacity aimed at productivity increases. This would lead to a loss of expertise and reduced national ability to provide highly competent researchers.

## Governance

Each industry has unique components, such as geographic spread, industry culture, and complexity and/or intensity of production, that influence the precise governance structure of their particular Rural R&D body. In general the governance structures have evolved though industry adaptation or in some cases through changes to statutory authorities.

The VFF believes that each industry is best suited to establish the exact nature of the governance structures of its R&D body provided fundamental principles of governance are followed. These include skills based appointments to boards and not politically popular appointments; a strong focus on transparency in operation and accountability to levy payers; and as comprehensive and thorough reporting on expenditure including valuing a return to stakeholders.

The focus on coordination activities between Rural R&D bodies through the council of chairs is a simple but effective mechanism to minimise duplication and subsequent waste across R&D bodies. The council of chairs should report to the levy payers each year as to activities and the outcomes of efforts to prevent duplication and coordinate research efforts.

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[17] *ibid*

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## Stakeholder

The VFF believes that the relatively strong performance in global terms, of the Australian Rural R&D sector has been enabled by the strong engagement of producer bodies in influencing research and development activities. The peak industry bodies generally provide stable and effective practical direction that puts the day to day operational farm perspective into the research agenda. The system of strong stakeholder engagement and involvement in setting the direction, management and performance of the RDCs is a fundamental reason for the performance and relevance of the R&D effort.

## Investment of RDC funds along the supply chain.

Any usage of RDC funding throughout the supply chain must be at the discretion of and with the support of the relevant industry. By ensuring the that industry, those funding the R&D, direct the down chain investment we can ensure that only areas where the benefits are guaranteed to be distributed back down the chain are supported.

A number of the RDC's currently to participate in R&D work throughout different stages of the supply chain past the farm gate (i.e. meat processing and textiles manufacture). While investments in the supply chain can deliver benefits to the industry as a whole, the structure of supply chains in many of Australia's agriculture markets provides the capacity for producers to be quarantined from benefits resulting from R&D.

A number of markets are typified by oligopsonistic structures that impact on the competitive nature of the participants. In addition in some case firms hold oligopoly as well as oligopsony powers. This provides the capacity for participants in some supply chains to capture the profits from R&D work. This presents the problem that the group funding the work, namely the primary producer, receives little or none of the benefits from the investment of their levy funds.

Given the nature of some of these market structures it would be inequitable to use producer funds to provide R&D that results in the benefit being captured down the supply chain.