

Senate standing committee on Rural and Regional
Affairs and Transport

SUBMISSION

Inquiry into Industry structures and
systems governing levies in the
Australian agriculture sector.

**Submission prepared on behalf of a group of agriculture sector
organisations by the Australian Farm Institute.**

Executive Summary

Agricultural research, development, extension and marketing activities carried out by levy-funded organisations on behalf of farmers and the Australian Government have been critically important in the growth of the Australian agriculture sector over the last twenty five years, especially in the face of declining government support for these activities.

With the progressive freeing up of global agricultural trade, new competition has emerged in international agricultural markets, making it more important than ever that the Australian agriculture sector optimises efforts to increase productivity and hence international competitiveness.

Available evidence identifies that productivity growth in the Australian agricultural sector has been largely static over the last decade, while agricultural productivity has continued to grow in major competitor nations such as Canada, the USA, Brazil and New Zealand.

While there are a range of different factors that contribute to agricultural productivity growth, available evidence highlights the importance of sustained investment in agricultural research and development as a critical factor.

Australia's levy-funded rural research and development corporations (RDCs) have played, and are playing an increasingly important role in funding agricultural research and development in Australia, in the face of declining levels of investment by state governments. The leverage that the pool of levy funds provides for the sector in securing R&D funding from both Australian and state governments in Australia is critical to maintaining national agricultural R&D investment levels.

Australian RDCs maintain a range of different mechanisms through which they are accountable to levy payers. These include annual reports, regular external reviews, votes on levies and board membership, audit processes and communication programs. The specifics of these arrangements vary by commodity sector, depending on the specific characteristics of that sector. There is no single accountability framework that would be appropriate for all commodities, however the *Levy principles and guidelines* published by the Australian Government provides a set of rigorous processes to ensure that levy payers have adequate opportunities to determine the levies that are applicable to their specific sector.

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This submission.

A range of agricultural sector representative organisations which have a direct interest in rural research and development outcomes and which interact closely with rural Research and Development Corporations wish to provide a combined response from across the agriculture sector to the issues addressed by the Senate Standing Committee on Rural and Regional Affairs and Transport inquiry into industry structures and systems governing the management of agricultural levies for research, development and marketing in Australia

This submission has been prepared by and for the agricultural organisations representing levy paying producers and processors that provide industry based guidance on research and development investments listed below. Some of these organisations are formally acknowledged by regulation under the PIRD Act, in some industries they are the “prescribed industry bodies” in others the “recognised organisation”.

Australian Forest Growers	Australian Chicken Meat Federation
Australian Honeybee Industry Council	Australian Lot Feeders' Association
Australian Lot Feeders Association	Cotton Australia Ltd
Australian Pork Limited	Australian Dairy Farmers Limited
GrainGrowers Limited	National Aquaculture Council
Australian Forest Products Association	Sheepmeat Council of Australia
Australian Mushroom Growers Association	Rice Growers Association
Cotton Australia	Australian Fodder Industry Association
Wool Producers	National Aquaculture Council
Grain Producers Australia	Wine Grape Growers Australia
Lucerne Australia	Dairy Connect

Terms of Reference

In September 2014, the Senate moved that the following matters be referred to the Rural and Regional Affairs and Transport References Committee for inquiry and report:

The industry structures and systems governing the imposition of and disbursement of marketing and research and development (R&D) levies in the agricultural sector, with particular reference to:

- *an audit of reports, inquiries and reviews relevant to this inquiry;*
- *the basis on which levies are imposed, collected and used;*
- *competing pressures for finite R&D funds;*
- *the opportunities levy payers have to influence the investment of the levies;*
- *the opportunities levy payers have to approve and reapprove the imposition of levies;*
- *the transformation of R&D and marketing into increased returns at the farm gate, including the effectiveness of extension systems;*
- *collaboration on research to benefit multiple industry and research sectors;*
- *industry governance arrangements, consultation and reporting frameworks; and*
- *any other related matter.*

This submission has been prepared to address the issues raised in the Terms of Reference for this inquiry.

Introduction.

The Senate Standing Committee on Rural and Regional Affairs and Transport inquiry into the structures and systems governing agricultural research, development and marketing levies in Australia is occurring at a time of significant change for Australian agriculture, and the opportunity to reconsider and re-evaluate industry systems and structures is opportune.

Amongst the factors contributing to current changes in the operating environment for Australian agriculture are the following;

1. The emergence of a significant surge in global demand for agricultural products, arising from the changing consumption patterns of middle class consumers in developing nations.
2. The progressive reduction that is occurring in agricultural trade barriers, which is resulting in the globalisation of national agricultural sectors as developing nations look to meet an increasing share of their total food, fibre and feed needs from international sources.
3. The emergence of highly competitive and increasingly sophisticated developing nation agricultural exporters which are competing with established agricultural exporters such as Australia for emerging markets. These include nations in South America and Eastern Europe, in particular.
4. Evidence that agricultural productivity growth in Australia in particular, and to a lesser extent in other developed nations such as the USA and Canada is stagnating, reducing the competitiveness of the agricultural sectors of these nations relative to developing nation agricultural exporters.
5. The emergence of increasingly specific consumer demands as wealth increases is imposing increasing pressure on supply chains to verify product safety and production standards.
6. Increasing concentration is occurring in markets for agricultural inputs, and in agricultural output markets both domestically and internationally. This is resulting in escalating pressure on farm margins, and forcing farmers to seek ways to improve competitiveness and to secure market premiums.

These factors are impacting on participants in the agriculture sector at the same time that broader factors such as the digital revolution, general population ageing, urbanisation and overseas migration are also having profound effects on the Australian community.

Importantly, the impacts of all these factors is not uniform across the Australian agricultural sector. Some are having more specific impacts on sub-sectors that are more export dependent, or for producers of livestock rather than plant products. In some cases changes are leading to increased opportunities, while in others the changes are creating additional challenges.

Against this background, the activities of Australian levy-funded agricultural research, development, extension and marketing organisations provide important benefits to both Australian farmers and the wider Australian community. They provide a mechanism for Australian farmers to collectively respond to the increasing competition they are facing in international and domestic markets, and also where relevant, to promote the qualities of Australian products to international and domestic consumers.

Importantly, Australian levy funded agricultural organisations (often referred to as Rural Research and Development Corporations or RDCs) operate in a range of different ways within the specific sub-sectors of agriculture that they service, with these being reflective of the different industry and market circumstances in which they operate. This structural and operational flexibility is an important feature of the Australian agricultural innovation system.

Justification for collective action.

Before addressing the specific issues raised as part of this inquiry, it is important to develop a clear understanding of the justification for undertaking collective research, development, extension and marketing activities in the agriculture sector, and also the justification for public expenditure in this area.

For Australia's rural sector, which is dominated by small businesses which operate in volatile markets and which face a relatively high levels of risk and low levels of profitability compared to businesses in other sectors of the economy, there are perhaps six main factors that require consideration in R&D policy formulation aimed at increasing innovation and productivity in the sector.

- 1. Individual rural businesses cannot capture most of the benefits associated with successful rural R&D investment, meaning aggregate sector investment in R&D will be low, reducing regional and national economic wealth unless strong incentives are provided or government investment occurs.**

The agriculture sector in Australia consists primarily of small businesses. The average total cash receipts for all broadacre farms with output in excess of \$40,000 per annum in 2013 was \$427,000, and less than 5% of all businesses had gross output in excess of \$1 million. Given the relatively low rates of return of these businesses, and the fact that it is difficult to capture (through intellectual property ownership or branding) the benefits of successful research in rural industries (even if it could be sustained financially by a farm business), there is little or no realistic opportunity for most of these businesses to invest in R&D to the extent and for the length of time that it would normally require to generate outcomes that would make the investment profitable for the individual business. This applies in particular to more basic research, but given costs and timeframes involved, even to research associated with near-commercial innovations.

Rather than individual farm businesses, however, it might be anticipated that rural service organisations such as chemical or fertiliser manufacturers, plant or animal breeding companies or machinery and equipment manufacturers would conduct R&D, and subsequently market the resulting technology to generate a return on that investment. However, much R&D in rural industries is directed at issues which, even if the R&D is successful, it is quite difficult if not

impossible to secure ownership of rights to, and to be able to subsequently protect those rights. In addition, the biological processes which are the subject of much research are highly complex and often involve the human food chain, which necessitates comprehensive and expensive compliance and food safety testing before products can be released.

An added disincentive for investment in agricultural R&D in Australia arises as a consequence of the export-oriented nature of the sector and the relatively small scale of the sector in global terms. Australian agricultural products are marketed into a wide range of international markets, all of which have specific biosecurity and food safety compliance requirements for imported products. Even if a novel agricultural or veterinary chemical, for example, was developed through unique Australian R&D, the developer would need to obtain widespread international registration for its use, at costs that are reported to run into hundreds of millions of dollars per product, before it could be marketed to Australian rural producers for use on products destined for export. The relatively small scale of the sector in global terms creates additional disincentives for even domestically focused industries to develop new agricultural and veterinary products, as an example, as the costs of development and registration specific for the local market are often prohibitive to new products; certainly prohibitive for investment by single businesses.

These factors in combination create major disincentives for even large organisations to invest in agricultural R&D in Australia, except in specific areas where robust intellectual property rights can be secured. Such situations may include the development of specific plant varieties, or local applications for agricultural chemicals that have been developed internationally. Even in these cases, a large amount of investment in applied R&D will be required to understand the performance of the variety or product under different climatic and geographical situations before it is released, even in a relatively small market like Australia.

A relevant example in this regard is the development of GM cotton varieties in Australia. Even though the original genetic traits were developed internationally by Monsanto, extensive research had to be conducted by the CSIRO in Australia in order to integrate those traits into cotton varieties that were suited to Australian conditions. In the absence of this public investment, GM cotton varieties almost certainly would not have been released in Australia.

It is noteworthy that even in the case of other sectors of the economy (such as mining and manufacturing) where much larger businesses are involved and where R&D would be directed at processes and technologies for which intellectual property rights capture would appear to be more straightforward, the government maintains substantial incentives for firms to undertake R&D, because of the benefits innovation and productivity growth bring to the wider economy.

In the case of agriculture, the processes being researched are largely biological, are difficult to secure intellectual property rights over, and many of the inputs into production systems are highly variable and subject to constant change. This dictates that there is an even greater need to provide incentives or to support R&D than is the case in the rest of the economy.

- 2. There are multiple positive public good spillovers arising from successful agricultural research and development, which cannot be captured by individuals or the sector, and which provide social and environmental benefits both within Australia and internationally. There is also significant public good research carried out by agricultural research agencies on issues such as food safety.**

An important aspect of rural sector innovation and productivity growth that has long been recognised is the associated public-good spillovers that are frequently generated. At a very simple level, this is evidenced by the fact that the volume of national agricultural output has grown by an average of 6% per year over the past fifty years, while the area of land used for agriculture has shrunk by 16% over the same period. This means that the Australian community has been able to set aside some 83 million hectares of land for conservation purposes, while still enjoying the economic benefits generated by a growing agricultural sector.

The examples of spillover public-good benefits arising from successful rural innovation are numerous, and often much more complex than just being able to retire land for conservation purposes. A relevant example in this regard is the introduction of GM cotton varieties during the 1990s. Prior to the introduction of GM cotton varieties, the cotton industry needed to use large amounts of pesticides to control insect pests in crops. It was not uncommon for a single cotton crop to be sprayed up to 15 times during a growing season. Despite the best efforts of the industry, this heavy use of pesticides had negative impacts on human health in the communities associated with the industry, and also resulted in pesticide residues in waterways, and in other agricultural products produced in the region. A result was a number of incidents of contamination of beef with chlorflurazuron and endosulfan, which resulted in the temporary closure of export markets with a major negative economic impact on the rural sector during the 1990s.

The subsequent development of GM cotton varieties has resulted in an up to 80% reduction in pesticide use in cotton production (CSIRO, 2010), a dramatic reduction in pesticide residues in cotton catchment waterways, and a virtual cessation of incidents of communities being affected by spray drift. In addition, the Australian beef industry has been able to consolidate its position as a preferred supplier of safe and natural product to the highly discerning Japanese and Korean beef industries. At the same time, the cotton industry has been able to continue to generate strong economic benefits for regional NSW and Queensland, as well as generating important export earnings.

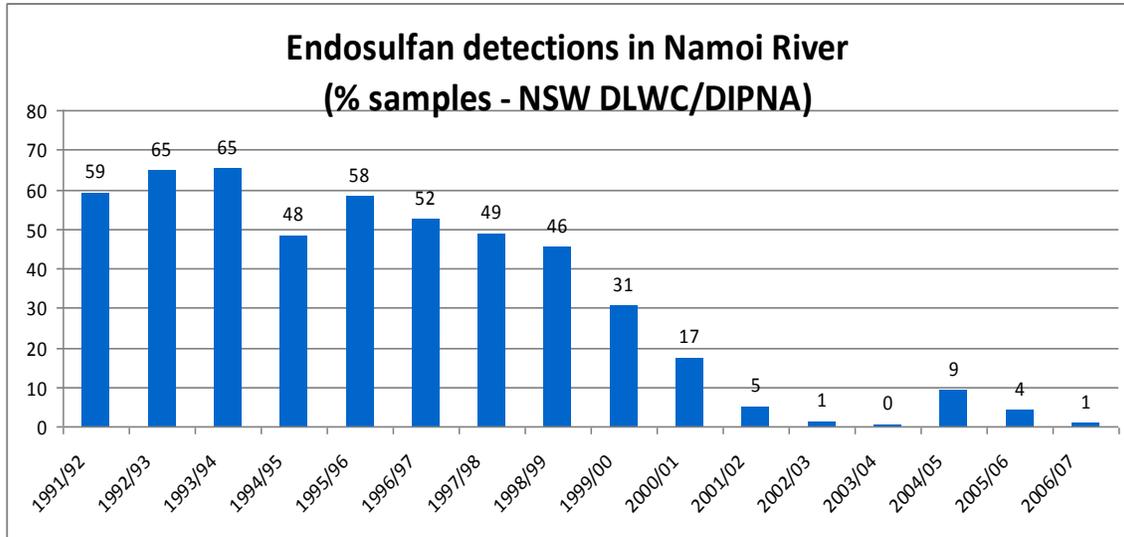


Figure 1. Endosulfan detections in Namoi River.

Source: Cotton Australia

A similar example exists in respect of the adoption of minimum tillage in the broadacre cropping sector in Australia. From virtually no use of minimum tillage in 1980 (D’Emden et al 2006) to almost 70% use for broadacre cropping in 2013 (ABS Statistics publication No. 4627.0, 2014) the adoption of minimum tillage in Australian crop production has produced multiple industry and community benefits. The industry benefits include a significant reduction in fuel use and machinery costs (Sijtsma et al 1998), an increase in crop planting flexibility, soil fertility and condition benefits (Tullberg et al 2003), (Rahman et al 2007), an increase in yields per millimetre of growing season rainfall, and the ability to better integrate cropping and pasture rotations. From a community perspective, the advantages include reduced water and wind erosion (Silburn et al 2007), leading to reduced siltation of waterways, and reduced runoff into environmental assets such as the Great Barrier Reef or major inland waterways.

Public good spillovers from rural research

Research (Burney, Davis and Lobell, 2010) has highlighted the very important public good spillovers that frequently arise from successful agricultural R&D. The researchers examined changes in crop yields over the last forty years, and the implications of those changes for greenhouse gas emissions from agriculture. Their conclusion was that the increased intensification of crop production (via increased yields) has delivered a major benefit in the form of reduced greenhouse gas emissions. The Executive Summary of the research stated;

As efforts to mitigate climate change increase, there is a need to identify cost-effective ways to avoid emissions of greenhouse gases (GHGs). Agriculture is rightly recognized as a source of considerable emissions, with concomitant opportunities for mitigation. Although future agricultural productivity is critical, as it will shape emissions from conversion of native landscapes to food and biofuel crops, investment in agricultural research is rarely mentioned as a mitigation strategy. Here we estimate the net effect on GHG emissions of historical agricultural intensification between 1961 and 2005. We find that while emissions from factors such as fertilizer production and application have increased, the net effect of higher yields has avoided emissions of up to 161 gigatons of carbon (GtC) (590 GtCO_{2e}) since 1961. We estimate that each dollar invested in agricultural yields has resulted in 68 fewer kgC (249 kgCO_{2e}) emissions relative to 1961 technology (\$14.74/tC, or \$4/tCO_{2e}), avoiding 3.6 GtC (13.1 GtCO_{2e}) per year. Our analysis indicates that investment in yield improvements compares favorably with other commonly proposed mitigation strategies. Further yield improvements should therefore be prominent among efforts to reduce future GHG emissions.

In concluding, the researchers argued that research to increase crop yields will deliver very important public benefits. Their concluding comments were;

The global population is expected to reach 8.9 billion by 2050, with food demand expected to rise by 70%. Even if yield gains over the next four decades are smaller than those of the previous four decades, the potential to avoid future emissions may be larger and more cost-effective than the 161 GtC of emissions avoided thus far, given that current cropland expansion often occurs in tropical forests and that the remaining forests are carbon-rich relative to many cleared forests. Improvement of crop yields should therefore be prominent among a portfolio of strategies to reduce global greenhouse gas emissions.

There are a large number of other examples available in virtually all sub-sectors of rural industries where successful R&D resulting in productivity growth has also created significant public good spillovers, ranging from more nutritious and higher quality products, through to improved human health, reduced and less dangerous pesticide residues, more efficient water utilisation, better standards of animal welfare, reduced smell and dust, and reduced water contamination. In addition, enhanced agricultural productivity is undoubtedly part of the reason that 50,200 Australian farmers were able to report that by 2012-13 they had set aside a total of 7 million hectares of farm land for conservation purposes. (ABS Statistical publication 4627.0, 2014).

An important issue in relation to these public good spillovers is that in the main they cannot be achieved in isolation from the industry benefit arising from the successful application of an R&D outcome or series of R&D outcomes. They are a consequence of successful innovation and the resulting productivity growth, but it is difficult if not impossible to predict the full extent of these spillovers in advance, or to attempt to achieve them in isolation.

This is because while R&D by its very nature targets a very specific and controlled aspect of a rural production system and tests the effect of a particular change, it is not always a straightforward process to simply adopt this change into a complex farming system.

Farming systems, by their very nature, involve the management of numerous interactions between biological processes and the environment. Changing one part of a system often has consequences for other parts of the system, and farm business managers need to make decisions about potential innovations against a background of constantly changing market, climatic and policy settings.

As a simple example, the adoption of minimum tillage systems which involve the utilisation of herbicides to kill in-crop weeds can also result in a post-harvest stubble that contains less herbage for grazing livestock, and results in added pasture re-establishment costs at the end of a cropping phase. For a farm business that relies heavily on livestock income, this may be a disadvantage that would discourage the adoption of a minimum tillage system, whereas pasture re-establishment may not be a consideration for a cropping specialist. A livestock specialist may also delay changing to minimum tillage because the benefits may not justify the added capital costs associated with purchasing new tillage equipment that will only be used to crop a small area each year. A specialist cropping enterprise, on the other hand, may find that a quick change to minimum tillage is justified.

This uncertainty in both the timing and the nature of adoption of successful R&D outcomes means that an undue emphasis on the pursuit of spillover benefits – either in selecting specific projects for research funding, or in developing overall rural R&D policies, is likely to produce poor outcomes from a rural productivity perspective. This, in turn, will mean that the projected public-good spillover benefits will not be realised, because they are dependent on the adoption of an innovation and not something that can be obtained in isolation.

It is noteworthy that the achievement of public-good spillover benefits is not a precondition of the R&D incentive that is provided to the non-rural sector, in the form of the R&D tax concession. This is sensible policy, and leaves businesses free to make their own choices about the R&D that has the best potential to enhance their productivity and competitiveness. There is no strong argument why decision-making at a sub-sector level for rural R&D investment should be any differently constrained or directed.

3. Risks and time-lags associated with R&D investment make such investment unviable for many businesses.

Agricultural R&D investment invariably involves a high level of risk, in comparison with other investments that may be available for a rural service provider or a rural business. There are also typically extended time-lags between a novel discovery, its development to a commercial stage, and its subsequent adoption in rural production and the generation of a return on the R&D investment.

Various estimates have been made of the time function associated with successful rural R&D, although most of these consider adoption rates, and do not encompass the full length of the cycle from basic research to commercialisation and adoption. Research into the time-lags and risks associated with rural R&D has been carried out by US researchers, using the rich supply of data

available from rural research activities over many decades in the USA. One group of US researchers noted;

“Many researchers underestimate the time lags between initial research investment and ultimate economic impacts. Research takes a long time to affect production, and then it affects production for a long time. The dynamic structure linking research spending and productivity involves a confluence of processes—including the creation and destruction of knowledge stocks and the adoption and disadoption of innovations over space and time—each of which has its own complex dynamics. That science is a cumulative process, in which today’s new ideas are derived from the accumulated stock of past ideas, influences the nature of the research-productivity relationship as well. It makes the creation of knowledge unlike other production processes.”(Alston, Pardy and Ruttan, 2008)

The history of the development of genetically modified Bt crop varieties provides a relevant example. The *Bacillus thuringiensis* (Bt) bacterium was initially discovered in 1901, and by 1938 it was being used by European farmers as an insect sprays in crops, and was field tested as an insect spray in the USA in 1958. By the 1980s, commercial interest in Bt grew as alternatives to synthetic pesticides were sought. The use of Bt toxin genes in genetically modified plants for pest control became an established field of research in the mid-1980s. From the mid-1990s, plants genetically modified to express the Bt toxin have become increasingly common, and are now grown widely in the USA and other countries (MAF, 2002). The first genetically modified crop grown in Australia used the BT gene and was planted in 1996. Since that time, its use has expanded to the extent that GM cotton varieties containing the Bt gene now account for 90% of the cotton grown in Australia. It is important to note that the GM cotton varieties grown in Australia arose as a result of a partnership between the CSIRO and Monsanto, and utilised cotton varieties that had been developed by the CSIRO for Australian conditions. This brief history highlights the extended timeframes and the accumulation of knowledge stocks over time that is a critical element of rural innovation.

A stylized representation of the investment timeframe associated with successful rural R&D is shown in the following figure. It highlights that there may be a lag of fifteen years before R&D investment starts to generate a positive cashflow, although some researchers suggest that the time-lags can be much greater. Some Australian research into this question suggests a 35 year timeframe might be a more appropriate model.

The adoption rates of new wheat varieties in NSW provide some support for this, especially as the graph only depicts adoption rates, and not the time period over which investment occurred prior to the release of the particular variety. It would be anticipated there might be 5-10 years of variety development and trials, prior to a variety being released.

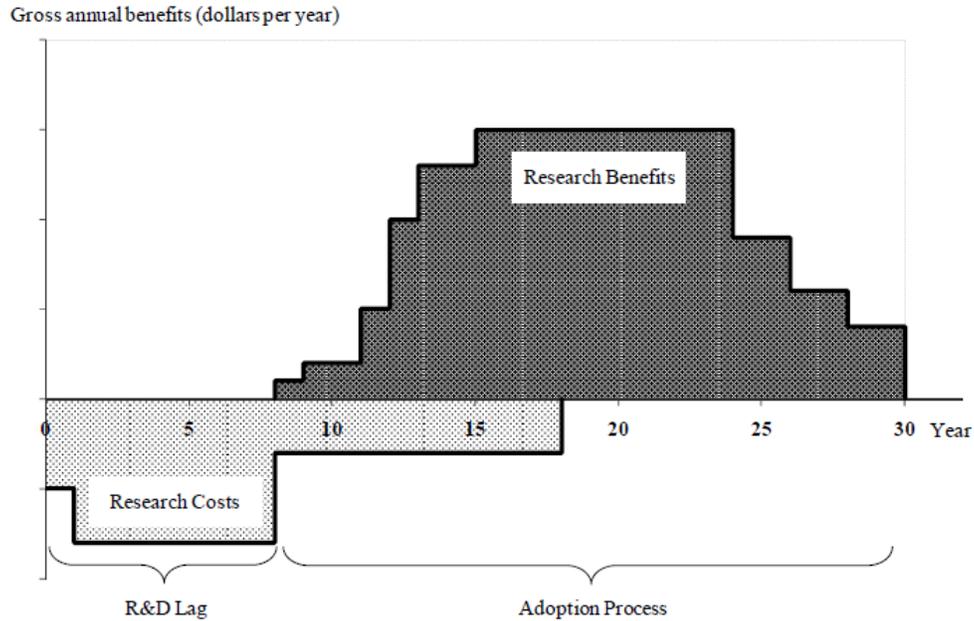


Figure 2 Stylised depiction of time-lags associated with rural R&D investment

(Source: Alston, Pardy and Ruttan, 2008)

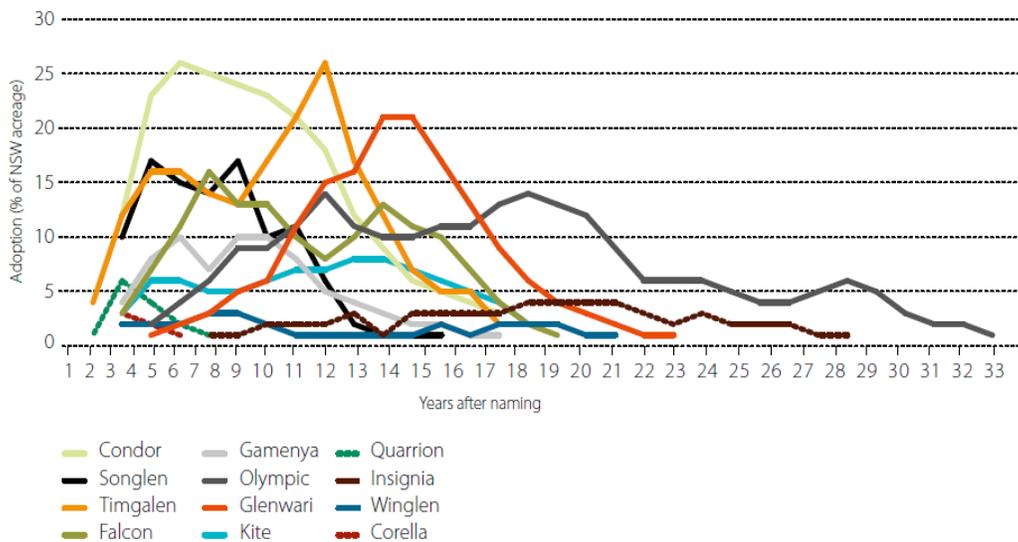


Figure 3 Adoption rates for wheat varieties in NSW

(Source: ABARE 2009b, citing Fitzsimmons, 1991)

While the stylized (and actual) depictions investment timeframes and time-lags associated with rural R&D investment are useful in understanding the challenges investors face, they do not provide a picture of the risks associated with rural R&D investment. Investment in R&D by its very nature is highly speculative, and that is one of the main reasons governments provide incentives for such investments. Risks include not only that the specific technology will be

unsuccessful, but there are also a range of regulatory risks associated with issues such as biosecurity and food safety that need to be considered. Sovereign risk is also an issue, with investors in GM crop technology in Australia over recent decades having discovered, for example, that State governments have a tendency to implement regulations on the use of specific technologies without warning, and for indefinite periods. There is also risk associated with the non-uniform production systems and environmental variations associated with production areas. As has been noted;

The atomistic structure of much of agriculture means that the attenuation of incentives to innovate is more pronounced than in other industries that are more concentrated in their industrial structure. On the other hand, unlike most innovations in manufacturing, food processing, or transportation, agricultural technology has a degree of site specificity because of the biological nature of agricultural production, in which appropriate technologies vary with changes in climate, soil types, topography, latitude, altitude, and distance from markets. The site-specific aspect circumscribes the potential for knowledge spillovers and the associated market failures that are exacerbated by the small-scale, competitive, atomistic industrial structure of agriculture. (Alston, Pardy and Ruttan, 2008)

For small businesses operating on narrow margins, or even for large businesses operating in a globally-small market such as Australia, the risks and time-lags associated with R&D investment are undoubtedly a major disincentive, and mean that there will be under-investment in rural R&D in the absence of strong incentives.

4. Some rural R&D investment is associated with the resolution of large-scale natural resource challenges, which would not be resolved without such investment, but which produce limited direct rural industry benefit.

Over recent decades, in addition to R&D investment into very specific aspects of agricultural production systems, there has been concerted research efforts associated with cross-sectoral industry issues, arising from which there is little or no incentive for R&D investment at either the firm or the commodity sector level. Examples of issues for which major sector-wide research efforts have been mounted include water quality and dryland salinity, vegetation and biodiversity conservation, water use in agriculture, the impact of climate change on agriculture, and mitigation of agricultural greenhouse gas emissions.

Typically, each of these programs has involved the allocation of major new funding by the Australian Government, by the Australian and State governments in partnership, or by both levels of government and industry (via resources allocated by RDCs).

These are all issues that have the potential to have a significant impact on rural sector productivity over the longer-term, but which require large research investments over an extended period, with much of the research effort directed at collecting basic information and monitoring long-term trends.

It is arguable that R&D investment into these issues should be the sole responsibility of Australian and State governments, given the broad community benefit that will potentially arise from the research. There is also a danger that diversion of industry R&D investments to these issues will mean that industries have reduced resources available to invest in productivity-

enhancing research, and that the result will be an effective reduction in rural R&D investment, with a consequent slowing in rural productivity growth.

It is noteworthy that despite the very important R&D investment incentives provided to businesses in other sectors of the economy by broad government R&D tax concessions, there is no similar requirement to contribute to R&D into these large, long-term public good issues imposed on businesses taking advantage of those tax concessions.

At the very least, the requirement that is placed on rural RDCs to invest in these initiatives (a requirement that appears to be increasing as State Governments progressively reduce funding for rural research and development at the State level) provides a strong justification for public funding of RDCs.

5. Australia's engagement in global markets necessitates considerable 'compliance' R&D investment to ensure Australian produce retains international market access.

The Beale Inquiry into Australia's biosecurity systems and the subsequent response by the Australian government again reinforced that biosecurity is an issue that incorporates both industry and public good. As the report arising from that inquiry noted;

The task of managing Australia's complex biosecurity regime has never been easy. In recent years, it has become even more challenging, principally for the following reasons:

- *globalisation, which is integrating the world economy and increasing the volume and range of products traded internationally;*
- *population spread into new habitats and increasingly intensive agriculture, which increases the risk of zoonoses (that is, animal diseases capable of transmission to human populations) and complicates the ability to contain, and increases the impact of, a pest or disease incursion;*
- *growth in tourism, passenger and cargo movements, which increases the risks of exotic pest and disease incursions despite the best efforts of border security;*
- *the potential risk of agri-terrorism involving animal rights extremists or political terrorist organisations;*
- *increasing global movements of genetic material as farmers endeavour to increase productivity, which places particular demands on pre- and post-border biosecurity services;*
- *climate change, which adds to the spread of pests and diseases (expanding range or habitats, changing migratory bird patterns, and weather events supporting the spread of disease vectors);*
- *an emerging shortage of highly qualified plant and animal pest and disease professionals—partly associated with 'baby boomer' retirements and partly the result of competing career alternatives;*
- *physical constraints for border interception activities, especially at major passenger airports; and*
- *financial constraints, as governments allocate scarce revenue among many competing demands.*

In responding, the Australian government acknowledged that Australia depends on trade, and this brings with it unavoidable risks. The government acknowledged that managing these risks,

and managing the possible outbreak of a pest or disease is becoming more challenging, due to factors such as climate change, intensification of agriculture and urbanisation.

R&D investment into agricultural diseases and pests is important in maintaining Australia's biosecurity status for agricultural trade purposes, but also to minimise the risk of pests or disease imposing a major economic cost on the nation (as was experienced with outbreaks of Newcastle disease in the poultry industry from 1999 to 2002) and as would be the case in the event that a major outbreak of Avian Influenza.

Given the significant public good associated with maintaining international market access for Australian agricultural products, and the associated public good associated with Australia's high biosecurity status, a strong argument exists for continued public funding to be made available for R&D in support of these two areas.

6. The maintenance of core R&D infrastructure and personnel provides a 'fire brigade' which can be activated in the event of biosecurity and other disease challenges, and which also provides the basis of a rural services export industry.

In earlier times, Australian State Governments maintained a strong agricultural research and extension capability through State Departments of Agriculture or Primary Industries. Not only did the staff within these agencies provide a direct service to rural industries, but these Departments also served as an important training-ground for agricultural science, veterinarian and agricultural economics graduates. Subsequent to their periods with State Governments, many of these personnel moved on to roles in the private sector as service providers and advisors to rural businesses.

The progressive reduction in resources provided by State governments to these agencies has meant that there is a greater reliance by them on project funding provided by the RDCs to maintain staff positions and research facilities.

The supply of skilled and qualified rural industry personnel is important not only to maintain rural productivity, but also because those personnel form the basis of an export services sector for overseas nations seeking to improve their agricultural performance. Just as the success of the Australian mining industry has spawned a rapidly growing mining services export sector, so Australia appears to have an opportunity to develop a much stronger rural services export sector. Such exports bring important national economic and diplomatic benefits and also help to maintain a well-trained professional workforce to service the rural sector and to respond in the event of major disease or other natural disasters. There is a strong argument to support public funding allocations to rural R&D corporations for this purpose.

While the above considerations relate more generally to public funding of research and development activities, the contribution from farmer levies makes up a significant proportion of the total pool of funds available for agricultural R&D investment in Australia.

Relevant reports and reviews.

The activities of levy-funded agricultural RDCs in Australia have been subject to an extensive number of reviews over a considerable period of time. A summary of the relevant reviews and the results of these has been compiled by the Productivity Commission (Productivity Commission, 2011), and was provided in the report arising from an inquiry by the Productivity Commission into rural research and development corporations conducted during 2010.

In the final report arising from that inquiry, the Productivity Commission concluded;

- *Various evidence suggests that R&D sponsored by the RDCs has been of significant overall benefit to both the rural sector and the wider community.*
- *As a vehicle for planning, funding and delivering rural R&D, the RDC model has important strengths, namely:*
 - *strong linkages with industry that promote soundly based investment decisions and greater or faster adoption of the resulting research outputs*
 - *the capacity to perform a systems integrating role across the broader framework, leading to, amongst other things, less wasteful duplication of research effort*
 - *accumulated expertise in brokering and managing research and flexibility in choosing the most appropriate basis for allocating research funding.*

The Productivity Commission subsequently noted the relatively high level of benefits accruing to the ‘industry’ for research and development activities by RDCs, and questioned whether government (public) contributions should remain at the dollar-for-dollar matching level that has been in place since the inception of RDCs in 1989. That question aside, the Productivity Commission did not question the relatively high rates of return available from investment in rural research and development in Australia.

Assessing the returns available from investment in rural R&D is not a simple task. Any analysis is complicated by the fact that R&D is inherently risky, that knowledge accumulation can result in innovations not foreseen at the time of the research, that innovations can develop from new knowledge generated either within or outside the industry, and that there is commonly a multi-decadal time lag between the discovery of new knowledge and the adoption of innovations arising from that knowledge. As discussed earlier, successful rural R&D also commonly generates spillover benefits that extend well beyond the agriculture sector, and attributing a value to these spillover benefits is not easy. As a simple example, the pioneers of human in-vitro fertilization in Australia were agricultural researchers, but the spillover benefits of their early research would be almost impossible to place a value on.

There have been a range of different studies conducted both in Australia and internationally to calculate the returns that are generated from investment in rural R&D. A summary of the results of these studies was reported by Mullen and Crean (Mullen and Crean 2007), and is displayed in the following table.

Table 1 Estimations of rates of return to agricultural R&D investment.

Researchers	Period investigated	Details	Results
Scobie <i>et. al.</i> 1991	Prior to 1990s	Returns to research expenditure in the Australian wool industry	Average national IRR of 9.5%. IRR to woolgrowers of 25%
Mullen and Cox 1995	1953-1988	Returns to public research expenditure in Australian broadacre agriculture.	Returns between 15% (35 year research lag) and 40% (16 year research lag)
Mullen and Strappazon 1996	1953-1994	Returns to public investment in Australian broadacre agriculture research.	Returns between 18% (35 year research lag) and 39% (16 year research lag) p.a.
Cox <i>et. al.</i> 1997	1953 - 1994	Returns to public investment in Australian broadacre agriculture research.	Marginal IRR to research and extension expenditure of 12-20%
Alston <i>et. al.</i> 2000	1953 - 2000	Meta-Analysis of reported rates of return to agricultural R&D investment for 292 studies published internationally.	Median return of 48.0% p.a. for research, 62.9% p.a. for extension, and 37% p.a. for returns to research and extension combined.
Shanks and Zheng 2006 (Productivity Comm.)	1970s - 2004	Rates of return to public R&D investment in Australian agriculture.	24% - 32% rate of return p.a. depending on assumptions.
Wang (2006)	1953 - 2003	Returns to public investment in Australian broadacre agriculture research.	IRR of 11% to 35% per annum
Mullen, 2007	1918-2003	Rates of return to Australian research and extension expenditure under different scenarios.	IRRs of between 14 and 17%

Source: Mullen and Crean 2007

Importantly, the conclusion from the review of these studies is that there is no evidence that the rates of return from agricultural research have, or are likely to decline over time.

More recently, a specific initiative has been undertaken by the Council of Rural Research and Development Corporation Chairs (CRDCC) to evaluate investment returns arising from Australian research projects funded by RDCs (Council of Rural Research and Development Corporation Chairs, 2008, 2010). This work has involved, firstly, the development of an agreed project evaluation methodology, and secondly the use of that methodology to evaluate a sample of projects that have been funded and managed by the RDCs. The 2008 evaluation of 32 randomly selected projects estimated that the average rate of return for each dollar invested was approximately \$11, with the benefits being shared approximately equally by the industry and the community.

A second round of analysis examined a further 59 randomly selected research programs, and concluded that over a twenty five year timescale, returns to investment were \$10.51 for every dollar invested. This research also identified that investment returns were quick to be realised, with 60% of projects showing a positive net present value return by five years and 77% showing a positive net return after ten years.

The research report noted that it was not possible to evaluate environmental and social benefits arising from many of the projects, and the estimated rates of return therefore underestimate the full set of benefits derived from the research.

Various RDCs have also used that and similar methodology to assess the returns arising from their marketing activities on behalf of levy payers, and the reports arising from this research is available from various RDC websites.

As an example, Meat and Livestock Australia has reported on the results of independent economic analysis to assess the impact of MLA beef marketing campaigns in Japan and Korea, and in the Australian domestic market (The CIE, 2011). That assessment concluded that the program expenditure by the MLA in Japan and Korea resulted in a benefit/cost ratio of approximately 4.7 to 1, meaning that it generated \$4.70 of benefits for every dollar invested in the program, an internal rate of return in excess of 75%.

The above research, and the large number of similar evaluations that have been carried out by RDCs over an extended period of time, highlight the robustness of appraisal that is a feature of the agricultural innovation system in Australia, but which is not found in the case of similar organisations in many locations internationally.

The basis on which levies are imposed, collected and used.

The history of current industry research and development levies in Australia extends back to the early 1980s. At that time there were various different arrangements in sub-sectors like wool and sugar involving the collection of levies from farmers for various purposes. Agricultural research and development funds at the Australian Government level were administered by various committees, although there was concern that these funds were allocated with little reference to the rates of return such funding would generate (Productivity Commission, 2011). The *Rural Industries Research Act 1985* replaced the committees with commodity research councils, although concerns persisted about the efficiency and effectiveness of fund allocation, and the linkages between these councils and industry. There were also concerns about the lack of coordination between different commodity sub-sectors.

The *Primary Industries Research and Development Act* (PIRD Act) was enacted to create statutory bodies to receive levy funds and manage the use of those funds on behalf of levy payers, although several commodity corporations were established prior to this legislation being introduced. The benefits of the statutory model were seen to be that the organisations were accountable to levy payers, and took control of R, D&E investment decisions away from researchers and research organisations. There are now fifteen RDCs, nine of which are established as industry-owned corporations with their own specific legislation, and the remainder of which operate under the provisions of the PIRD Act.

All the RDCs operate under the same general principles, which involve the ability to collect levies from farmers producing the relevant commodity, and a commitment from the Australian Government to contribute taxpayer funding to match farmer levy payments, with the taxpayer contribution capped at an amount equivalent to 0.5% of the gross value of production of the relevant commodity. It should be noted that the matching government funding is provided for levy funds allocated to R, D&E expenditure only, and additional levies collected for marketing or other purposes do not trigger matching government contributions. A number of the RDCs also collect voluntary levies from farmers, and in some cases processors involved in the relevant commodity.

One of the RDCs (Pork) also performs an industry representation function, in addition to their roles in R&D and marketing. This is an exception to the general rule that RDCs do not have an industry representation role, which rule is specifically expressed as part of the formal funding agreement between the Australian Government and the RDC.

The exception in relation to the Pork sector is, in part, derived from the fact that the commodity sector has a relatively small numbers of farmers involved, and it is not cost effective to try to maintain a separate organisation within the commodity sub-sector. The ability to represent farmers involved in the commodity sub-sector brings with it a degree of constraint, in that the organisations is able to raise issues directly with government, but is largely required to refrain from public advocacy on behalf of its members, or to publicly criticise government policies or become involved in partisan politics.

More generally, industry representation and advocacy activities are carried out by farmer organisations largely funded by voluntary membership contributions. These include state farm

organisations, national farm organisations and agricultural commodity organisations. There are approximately 90 of these organisations identifiable in Australia operating at either the state level, or the national level for all of the farm sector or a specific agricultural commodity. There are a number of critical differences between representative organisations (which are structured to give all members an equal opportunity to influence policy decisions) and research and development corporations (the governance of which involves the utilisation of a range of specific skills to generate an optimal return from investments). A lack of understanding of the fundamental differences between these two types of organisations often leads to misunderstandings by farmers and policymakers about the role they believe RDCs should play, and how they should be structured and governed.

The underpinning basis for levy arrangements for each of the RDCs is the *Australian Government Levy Principles and Guidelines* document (Department of Agriculture, 2009). This document details the processes that are required to establish a compulsory levy for a specific agricultural commodity sub-sector, and also the processes that are required in proposing to amend an existing levy. The ‘foundation stone’ for commodity levy arrangements are the twelve levy principles, detailed in the Levy Principles document. These are as follows;

1. *The proposed levy must relate to a function for which there is a market failure.*
2. *A request for a levy must be supported by industry bodies representing, wherever possible, all existing and/or potential levy payers, the relevant levy beneficiaries and other interested parties. The initiator shall demonstrate that all reasonable attempts have been made to inform all relevant parties of the proposal and that they have had the opportunity to comment on the proposed levy. A levy may be initiated by the Government, in the public interest, in consultation with the industries involved.*
3. *The initiator of a levy proposal shall provide an assessment of the extent, the nature and source of any opposition to the levy, and shall provide an analysis of the opposing argument and reasons why the levy should be imposed despite the argument raised against the levy.*
4. *The initiator is responsible to provide, as follows:*
 - *an estimate of the amount of levy to be raised to fulfil its proposed function*
 - *a clear plan of how the levy will be utilised, including an assessment of how the plan will benefit the levy payers in an equitable manner*
 - *demonstrated acceptance of the plan by levy payers in a manner consistent with Levy Principle 2.*
5. *The initiator must be able to demonstrate that there is agreement by a majority on the levy imposition/collection mechanism or that, despite objections, the proposed mechanism is equitable under the circumstances.*
6. *The levy imposition must be equitable between levy payers.*
7. *The imposition of the levy must be related to the inputs, outputs or units of value of production of the industry or some other equitable arrangements linked to the function causing the market failure.*
8. *The levy collection system must be efficient and practical. It must impose the lowest possible ‘red tape’ impact on business and must satisfy transparency and accountability requirements.*

9. *Unless new structures are proposed, the organisation/s that will manage expenditure of levy monies must be consulted prior to introduction of the levy.*
10. *The body managing expenditure of levy monies must be accountable to levy payers and to the Commonwealth.*
11. *After a specified time period, levies must be reviewed against these Principles in the manner determined by the Government and the industry when the levy was first imposed.*

Amendments to existing levies

12. *The proposed change must be supported by industry bodies or by levy payers or by the Government in the public interest. The initiator of the change must establish the case for change and where an increase is involved, must estimate the additional amount which would be raised. The initiator must indicate how the increase would be spent and must demonstrate the benefit of this expenditure for levy players.*

In addition to meeting these requirements, RDCs charged with managing levy expenditure are required to undergo an annual audit, to convene an Annual General Meeting at which levy payers have the opportunity to vote on various aspects of the operation of the organisation including levies and board membership. Board members and senior executives of the RDCs are also required to regularly appear before Senate estimates committees and to provide detailed responses to questions about their management and expenditure of industry levies and matching government funds.

Total levies collected each year by the Levies Collection Unit of the Department of agriculture are publicly reported, together with levy administration and other associated costs. The following table is a summary of levies collected in the past three years. It should be noted that these include levies collected for both R&D and marketing, with only the levies for R&D (approximately \$238 million) attracting matching government funding.

An important issue that is often overlooked in relation to the levy system in Australian agriculture is that the mechanism of industry levies and matching government funding was initially introduced to provide businesses in the agriculture sector with some equivalence in relation to the Research and Development tax concession that is more generally available to larger-scale businesses in the economy. The R&D tax concession that is available to larger-scale businesses was first introduced in 1985, when governments recognised the need for increased innovation to foster productivity growth in the Australian economy. Large businesses that are eligible have generally been able to deduct between 125 and 150% of the cost of eligible R&D activity from their tax, with the specific amount having gone through a number of adjustments over the time since the measure was introduced. For a considerable period this concession was only available for firms spending a minimum of \$20,000 annually on eligible R&D, precluding most farm businesses from accessing the measure.

Recognising this, the Australian Government introduced the current rural industry levy arrangements and matching government contribution in 1989 to secure funds for agricultural R&D, with this arrangement being effectively equivalent in terms of total government contribution to the rural industry R&D cost. Even though changes to the general R&D tax arrangements in the past three years have made them more accessible to farm businesses, the cost

and complexity of rural R&D means that the R&D incentive more generally available to large corporations in the economy is not accessible for the average Australian farm business.

The added advantage of the levy arrangements and matching government funding are that they provide a degree of certainty in relation to long-term funding levels for rural R&D in Australia. By its very nature, rural R&D requires a long-term commitment of resources in order to be successful, and the current legislated levy arrangements in Australia ensure that both governments and industry remain committed to R&D over the long-term, and are not subject to fluctuating funding based on current fiscal conditions.

Table 2. Australian agricultural levy collections.

Levy Recipient Body	2011-12 Actual (\$)	2012-13 Actual (\$)	2013-14 Actual (\$)
Animal Health Australia	6 199 420	6 432 242	7 138 856
Australian Egg Corporation Limited	6 240 455	5 491 612	7 045 342
Australian Grape & Wine Authority ²	17 183 774	17 116 821	18 486 133
Australian Meat Processors Corporation	16 913 979	18 055 718	20 202 353
Australian Pork Limited	11 136 402	12 279 206	12 423 453
Australian Wool Innovation	48 088 665	43 744 739	43 308 614
Cotton Research & Development Corporation	9 531 898	11 801 096	10 977 077
Dairy Australia Limited	30 858 238	31 282 632	32 981 436
Fisheries Research & Development Corporation	165 634	127 204	148 956
Forest & Wood Products Australia Ltd	4 071 383	3 667 921	3 991 812
Grains Research & Development Corporation	97 808 859	118 396 000	120 416 725
Horticulture Australia Limited	37 032 274	41 198 123	42 110 614
LiveCorp	3 059 275	3 169 751	4 305 821
Meat & Livestock Australia	91 777 979	93 789 332	106 000 399
National Residue Survey	9 133 894	9 553 323	10 442 360
Plant Health Australia	1 615 730	1 951 769	2 229 210
Rural Industries Research & Development Corporation	4 213 033	4 623 309	5 475 688
Sugar Research Australia	3 853 837	4 341 583	19 560 494
Wheat Exports Australia	4 799 292	698 418	22
Total	403 684 022	427 720 800	467 245 363

(Source: Department of Agriculture *Report to levies stakeholders 2013-14*)

Competing pressure for finite R&D funds.

One of the factors considered to be of significance in observed trends in agricultural productivity growth is the level of investment in agricultural R&D. In Australia's case, there is a chronic weakness in the available data on agricultural R&D investment levels, due to the lack of resources and focus on agriculture-sector statistics by the Australian Bureau of Statistics (Potard and Keogh, 2013).

Noting this limitation, the data that is available identifies that real public-sector investment levels in Australian agricultural R&D in Australia have been essentially static since the mid-1980s, after growing steadily over the years from 1950 to 1980. In terms of R&D investment intensity (that is R&D investment per dollar of industry gross domestic product), the real level of public sector investment in Australian agricultural R&D has actually been declining since the early 1980s.

It has been noted that the current slow-down in agricultural productivity growth is consistent with what might be anticipated as a consequence of the reduced R&D investment intensity, given the lag that is recognised between R&D investment, and subsequent uptake of resulting new innovations creating productivity growth.

Noteworthy in relation to investment levels is the significance of levy funding (and the associated matching government contribution). The most recent data available identifies that approximately \$500 million of the total public sector investment of around \$1 billion annually is sourced from farmer levy funds and associated matching Australian Government contributions, with this amount increasing in years of high returns to agriculture (such as 2001).

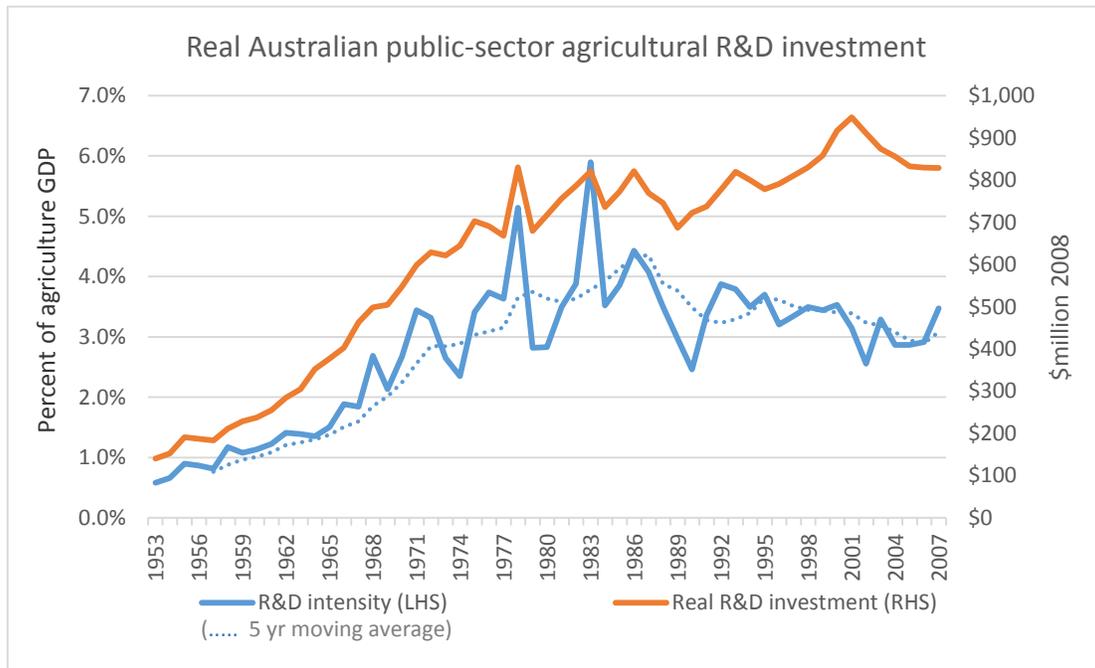


Figure 4 Real Australian public sector investment in agricultural research and development.

Source: Mullen, 2010

A major reason for the static or declining levels of public sector investment is the progressive reduction in agricultural R&D funding by state governments. As the following graphs highlight, state governments have progressively withdrawn from investing in agricultural R&D, to the extent that state government share of total agricultural R&D funding has declined from 53% in 1995 to 38% in 2007. The overall funding reductions have been largest in the more populous states such as NSW, Victoria and Queensland, as the following graphs highlight.

These graphs highlight the strategic importance of farmer levy funds, not just in leveraging matching funding from the Australian Government, but also in leveraging support from the states, and in helping to maintain state R&D capacity. RDCs typically commission state government agencies and universities to conduct research, but in doing so require those institutions or organisations to make a contribution to the overall project cost. In this way, the levy funds contributed by farmers play a very strategically important role in maintaining the agricultural R&D capacity of the Australian states, and also of the CSIRO.

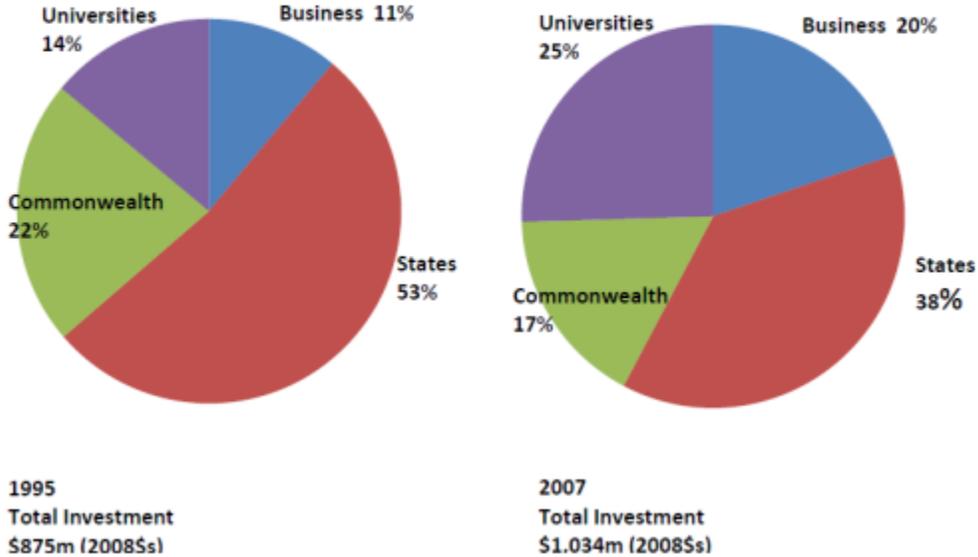


Figure 5. Share of agricultural R&D investment, Australia.

Source: Mullen, 2010

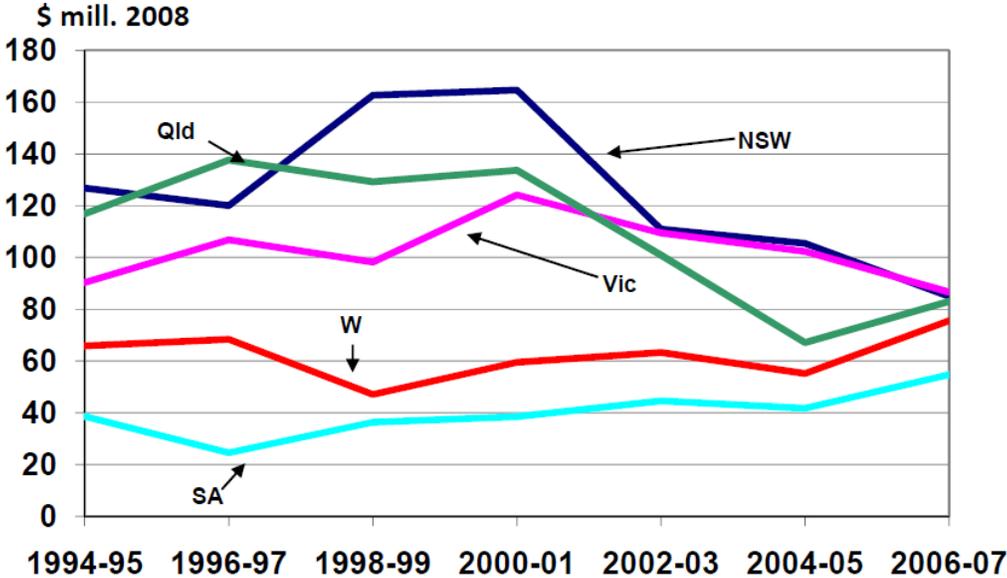


Figure 6. Real investment in agricultural R&D by State Governments

Source: Mullen, 2010

Opportunities for input by levy payers.

There are a range of different levy-payer consultation processes associated with different RDCs, with no one single levy payer consultation model in operation that is universally applicable across all RDCs. Speaking generally, most RDCs engage in consultative processes with the farm sector as part of the process of developing strategic plans (typically of 3-5 years duration), and then have in place reference committees that are used in the development of research priorities and annual operating plans. Most RDCs also hold Annual General Meetings (an exception being the Rural Industries Research and Development Corporation), at which levy payers are able to question the Board Members and Senior Executives, to elect Board Members, and to vote on a range of different resolutions including resolutions about levies.

In each case, the industries for which RDCs have been established also have an established Peak Body or Representative Organisation. These organisations are the representative and advocacy organisations for their specific commodity sector. They play an important role in providing a collective voice for members (who are also RDC levy payers), providing a communications pathway between RDCs and their levy payers, and working directly with the RDC to set the strategic direction and priorities for R, D&E on behalf of levy payers.

They also play an important role in assessing the performance of RDCs, and in many cases in making recommendations about levy rates. These organisations have direct connections with their membership base, and therefore provide a valuable communication conduit to levy payers (especially in smaller commodity sub-sectors) that is considerably more efficient than would be the case if RDCs had to establish direct communications on a regular basis with levy payers. It is also important that an organisation other than the RDC has the role of making recommendations about levy rates to levy payers, in advance of levy payer ballots. There would be a considerable conflict of interest if RDCs were required to make recommendations about their own future revenue to levy payers.

Government policy and good corporate governance provisions dictate that, generally, levy payers do not have the opportunity to directly elect persons to the Board of RDCs via a popular ballot, although levy payers do have the opportunity to endorse those nominated for Board positions via a selection committee process, or to elect directors from amongst those nomination for positions and who have met the requirements for that position. This may include having been endorsed to stand for election to a board position by a minimum number of levy payers.

This arrangement is the same as those that apply more generally in Australian shareholder corporations, which operate on the basis that good corporate governance requirements dictate that a board requires a balance mix of relevant skills and experience, and that a purely popular ballot is not an appropriate way to achieve such an outcome around the board table.

This is an issue that is sometimes contentious amongst levy payers in certain commodity sub-sectors, and stems from some confusion that occasionally arises about the respective roles of farmer advocacy or representative organisations and rural RDCs. In the case of advocacy organisations (such as State Farm Organisations or Commodity organisations) it is entirely appropriate to elect leaders and representatives by popular ballot, as the objective in this case is to elect representatives who best reflect the collective views of members. That said, it is

noteworthy that a number of Australian farmer advocacy organisations have recently appointed independent directors in order to ensure that there are appropriate corporate skills available on their Boards.

In the case of Board appointments for rural RDCs, experience in farming and agriculture is just one of a number of attributes that are required around the board table to ensure good corporate governance and careful stewardship of levy-payers funds. Amongst other required skills are R&D management, financial management, corporate governance and audit, and human resources management. The need to secure this wider range of skills and experience is the reason most RDC boards have in place a selection committee process. That said, most RDCs put forward their Board nominees for endorsement by levy payers at an Annual General Meeting, the exception being the case of some RDCs which are required to have Government nominees on their Boards.

While there are occasionally criticisms from some levy payers that there are not adequate opportunities to have an input on levy rates and the strategic direction and activities of rural RDCs, the experience of those seeking inputs on these questions is exactly the opposite of that sentiment. Some groups which have the responsibility of engaging with levy-payers and seeking their input (including rural RDCs themselves) face considerable challenges in being able to engage large numbers of levy payers in consultative processes, or in having them register for, and participate in ballots on industry levies. This applies in particular to the larger RDCs which have broader commodity and geographical coverage.

One of the challenges faced by farmer organisations in seeking the views of levy payers about future levy rates or strategic directions for RDCs is that there is a large ‘free rider’ problem associated with this activity. Levy payers who are not members of farmer organisations but who wish to have a say at forums designed to address these matters frequently do so, but without contributing to the costs associated with such exercises.

RDCs have a range of different measures in place that effectively allocate a small proportion of levy funds to the Representative Organisations or Peak Industry Councils who are engaged in these consultative processes. While such arrangements are justifiable on the basis of the costs involved in conducting these processes, there is merit in considering ways to make such payments transparent, non-discretionary, and clearly linked to the performance of relevant consultative processes.

Following are a number of case studies which provide details of the processes involved in different commodity sub-sectors in providing levy payers with opportunities to have input on the funding and strategic directions of levy-funded RDCs.

Case study: Australian Lot Feeders Association (ALFA)

ALFA has direct membership model, a directly elected board and committee structure; and a transparent and comprehensive consultation approach with the industry. For example, every year ALFA consults with the industry regarding the levy funded activities and budgets for the upcoming financial year. This annual consultation approach takes the form of both comprehensive surveys and presentations at ALFA’s Annual General Meeting where members

approve a motion regarding the levy programs and arrangements for the upcoming year. This feedback is then provided to the ALFA Council who uses it as part of its decision making process when it determines the priority areas for grain fed transaction levy expenditure.

ALFA organises extension and adoption workshops among the industry on an array of industry matters including R&D and marketing. ALFA has a close working relationship with MLA regarding such workshops with MLA assisting in their funding and organisation.

ALFA has also contracted an extension officer who works closely on the ground with lot feeders regarding animal health, welfare, R&D and Biosecurity matters. The role aims to provide information, education, training and technical services to improve management practices among such lot feeders. It was initiated following the recognition that small to medium sized feedlot operators have found it increasingly difficult to keep abreast of continual improvements in management practices. ALFA is striving to ensure that capability is being improved across the industry more broadly, rather than just within a narrow band of high achievers. The role is funded by both ALFA and MLA.

Case Study: The R&D levy in the rice industry.

The rice industry in Australia consists of some 1,500 growers, based predominantly in the Riverina region of NSW. Rice production is heavily reliant on irrigation water, and the scarcity of that water in Australia has resulted in the rice industry having an extremely strong focus on water efficiency, so much so that the United Nations regards Australia as having the most water efficient rice production system in the world. The water efficiency gains that have been achieved in the Australian rice industry are a result of a long-term commitment that growers in that industry have to research and development, which is partially funded by a levy on rice production.

The drought in southern Australia that extended from 2003 – 2009 resulted in a dramatic reduction in rice production, as irrigation allocations were reduced to negligible amounts for some years during that period. In 2005, faced with a dramatic reduction in R&D levy funding as a consequence of low rice production, the Rice Growers Association asked the Australian Government to increase the R&D levy from \$2 to \$3 per tonne. This decision was taken in order to bolster revenue for R&D in order to maintain the existing rice research program, rather than having to stop research projects and dismiss researchers. The Australian Government agreed to a temporary increase in the levy, sun-setting in three years, after which it would revert back to the \$2 levy. By 2008, the industry still had not been able to increase production, and despite cutting the R&D program by 25% and halving the size of the rice industry R&D committee, again faced dramatic cuts to its R&D budget. The industry again asked the Australian Government to retain the \$3 levy for an additional three years, sun-setting in 2011.

At that stage, the view of leaders of the rice industry was that the \$3 R&D levy should be retained, given the importance of successful R&D for the future of the industry. In order to have the Government agree to this, the industry was required to undertake a consultation process to demonstrate the support of the growers for the retention of the \$3 levy. This process was carried

out from February to August 2011, and culminated in a vote at the Rice Growers Association Annual Conference in August 2011.

The consultation process consisted of a number of different activities. A letter explaining the levy proposal was written to all 1,500 rice growers, which was subsequently followed up by fax and email. Subsequently, eight regional meetings were held, which were advertised extensively over a four week period in all regional newspapers servicing the area. A total of 306 people attended the meetings in persons, and at each a deliberative vote was taken on a motion expressing support for the retention of the \$3 levy. At the conclusion of this process a deliberative vote was taken at the Annual General Meeting, which again supported the retention of the \$3 levy.

The Australian Government, upon being advised of the results of this consultative process, subsequently approved the retention of the \$3 R&D levy for the Australian rice industry.

Case Study: Australian Beekeeping industry.

The Australian Beekeeping sub-sector is a small but critically important sub-sector of Australian agriculture, which is important in its own right on the basis of honey products produced, but also critically important as a service provider for the crop and horticultural sub-sectors. The Beekeeping industry participants maintain an industry levy which is managed by the Rural Industries Research and Development Corporation (RIRDC), for the purposes of funding industry research. Currently the industry collects a levy for the purposes of R&D and the Honey Bee Disease Contingency fund, a strategic reserve fund maintained by the industry to be used in the event that a disease outbreak necessitates hive destruction and subsequent loss of income for some industry participants, in order to prevent disease spread and loss of income through the entire industry.

A particular challenge for the Beekeeping industry is the relatively small number of industry participants, and their geographical diversity. This presents particular challenges for the sector in reaching agreement on issues like R&D levies. This also means that the costs associated with collecting levies can be quite high – in some cases exceeding the value of levies collected. At present the sector has a proposal before government to increase the levy, but also to increase the minimum production threshold for beekeepers who are required to pay the levy. In this way the efficiency of the industry will be able to be improved.

The underlying basis for Beekeeping industry research activities is the industries strategic plan, which is renewed every five years. All industry participants are given an opportunity to have input into this plan, via meetings that are held in different locations throughout Australia.

The levy funds collected on behalf of the industry are administered by the Honey Bee and Pollination Advisory Committee (HBAPAC) of the RIRDC, which currently has two (2) beekeepers appointed to it. The Australian Honey Bee Industry Council Inc. (AHBIC), being the peak body for beekeeping in Australia, is consulted by RIRDC on appointments to the HBAPAC

Representatives of the HBAPAC visit each State Beekeepers conference and give presentations on the activities of the HBAPAC including results of research projects that have been completed

and which research projects are to be funded in the coming year. There is ample time made available for questions and the representative usually stays for the full conference thus also allowing plenty of opportunity for levy payers to discuss the work of the HBAPAC. Any issues or problems are dealt with via the ability to adopt resolutions at the conference which can go directly to the HBAPAC or to AHBIC for consideration at their AGM. The Chairman of HBAPAC or the RIRDC Senior Program Manager attends the AHBIC AGM each year, where they give a presentation on the work of the HBAPAC. Again, these meetings provide an opportunity for any questions or motions that can be passed to go to the HBAPAC.

The AHBIC is not supportive of a mandatory industry ballot on levies, believing that the cost would far outweigh any benefit, and that such an arrangement would be extremely difficult to organise within the industry

AHBIC sees the levies as a sensible system where all eligible beekeepers pay contribute. If the levy arrangement was voluntary then limited funding would be available for industry R&D, and it would also be inequitable as any results achieved from R&D would benefit all beekeepers including those who did not contribute.

Case study: The Australian Pork Industry.

The majority of Australian Pork Limited's (APL's) funding comes from pork industry levies per carcass of \$2.525. Funds are collected by the Department of Agriculture, Fisheries and Forestry (DAFF). An amount of \$0.175 is retained and held in the National Residue Survey (NRS) Reserve, which operates under the National Residue Survey Administration Act 1992, and \$2.35 is paid to APL. Of the \$2.35 per carcass received by APL, \$1.35 is made up of the marketing component of the pig slaughter levy (Marketing levy) and \$1.00 the Research and Development (R&D) levy. Levy income received in the 2010/2011 financial year totalled \$10,805,939, of which \$6,207,983 was Marketing levy and \$4,597,956 R&D levy.

The second major source of APL funding is from the Australian Government through the Rural Research and Development (R&D) Corporations matching claims model. Like other rural industries, APL is fortunate to be supported by the Commonwealth through the reimbursement of 50 percent of eligible R&D expenditure.

APL levy income has reduced over the past few years due to the downturn in slaughter numbers. Additionally, the pig industry slaughter levy (Marketing and R&D components) has not increased since 1994 and during that time inflation has decreased purchasing power by 60%. APL has, over the years, delivered significant productivity improvements which have partially offset this erosion but it has now reached a point where delivery of the industry's core services will be severely compromised without an increase in levy income.

APL submitted one proposal to Government regarding amendments to the current levy structure in April 2008. It requested the removal of the split between the Marketing and R&D levy. This proposal is still with Government but not expected to proceed. A supplementary proposal was submitted in May 2009 requesting an amendment to the Primary Industries (Excise) Levies Regulations 1999 to adjust the levy rates within the limits set in the Primary Industries (Excise) Levies Act 1999. This amendment was to reduce the marketing levy by \$0.30 and increase the

R&D levy by the same amount with no impact on the total levy amount paid by levy payers. This adjustment was approved in December 2009.

APL through this submission and in meeting the requirements of the Australian Government's Levy Principles and Guidelines presented the case for an increase in the Pig Slaughter Marketing levy in December, 2011. A comprehensive independent cost benefit analysis has been completed to support the case for the increase; estimating the additional amount that would be raised; indicating how the funds would be spent and demonstrating how this expenditure will benefit levy players. APL has also conducted extensive consultations with producers, as required under the guidelines.

As part of the process, industry consultation took place from May 2011 to October 2011. APL has provided regular information on the proposed levy rate change to all levy paying pork producers, whether APL members or not, through pork media channels, state farming organisation networks and APL's external communication stream. APL has placed stories over the months in the rural media, information on the APL website and in APL publications, attended state farming organisation meetings and also distributed correspondence, including newsletters, updates and flyers and requested producers feedback and comments. Pig producers have also been directly communicated with by phone, letter, email or facsimile; and also face to face at regional meetings.

Following these consultations, a ballot was conducted (production weighted) which resulted in a vote of 73 percent for and 27 percent against the increase in the Marketing levy. The weighted production value of these votes was \$6.6 million for and \$2.4 million against in terms of levy paid.

Since the pig industry levy was last changed in 1994 the Australian pig industry has undergone significant changes in its operating environment. In particular, the ability of processors to import pig meat under certain conditions, has generated significant structural change. This has resulted in a dramatic reduction in the number of producers coupled with a drive by the remaining producers to improve their overall competitiveness and sustainability. This drive has been further demonstrated in the Shaping Our Future project where, in anticipation of consumer and community concerns, producers elected to voluntarily phase out the use of sow gestation stalls by 2017. This is a world first and is part of the overall APL strategy to differentiate Australian pork and part of the additional levies will be used to communicate these messages to consumers.

Over the years there has been, as part of the productivity improvements, an increase in the average carcass weights but this does not increase the overall levies as they are based on a per carcass criterion.

The APL Board recognises there will never be a right time to go to the industry to seek a levy increase. The process takes time, during which attitudes, confidence and unseen circumstances can always shift priorities. Cost pressures on producers make it hard for some to see the value of further cost increases. An affordable, staged approach to a levy increase was presented as an option and this staged approach is supported by the Australian pork industry.

The Australian pork industry recommended to the Minister the Marketing levy is increased by \$0.90, and that it occurs in a staged process over three tranches;

- The first stage of the levy increase to be \$0.30 to come into effect from 1 July 2012;
- The second stage of the levy increase to be \$0.30 and come into effect from 1 July 2014; and
- The third stage of the levy increase to be \$0.30 and come into effect from 1 July 2016.

Case study: Cotton industry.

The cotton industry in Australia consists of approximately 800 growers located in irrigation regions stretching from central Queensland to northern Victoria, plus associated service providers and post-farm ginning and exporting organisations. There are two main organisations associated with the sector, these being the Cotton Research and Development Corporation (CRDC), and Cotton Australia.

Cotton Australia members are industry organisations and/or corporations. Virtually all Australia's cotton growers are members of regional Cotton Growers' Associations (CGAs) and all CGAs are members of Cotton Australia. Members' nominated representatives attend general meetings and elect the Directors of the company. All cotton ginning companies are also members of Cotton Australia. Harvested cotton must be processed to produce a saleable commodity (lint and seed). Ginning is the process of separating seed, trash and lint. In this sense the ginners are as essential to cotton growers as refineries are to sugar growers.

The Cotton Research and Development Corporation is funded via a statutory research and development levy, of \$2.25 per (227 kg lint) bale, which is compulsory for growers to pay at the point of ginning under the Primary Industries (Excise) Levies Act 1999. Levies are collected by the processors (cotton gins), forwarded to the Department of Agriculture Fisheries and Forestry, Levies Revenue Service (LRS) before remittance to the CRDC.

It is voluntary for cotton growers to pay a levy also of \$1.50 per bale to Cotton Australia Limited. The Cotton Australia levy is also collected by the processors (cotton gins) and forwarded Cotton Australia; growers may also elect to pay their levy directly to Cotton Australia.

Cotton Australia has a very hands-on role in the industry, including a team of Regional Managers whose core role is to service grower needs and support the adoption of the industry accreditation scheme "myBMP". Likewise, policy staff confront immediate political and industry issues, which are often the core topic of debate and discussion at cotton grower association meetings. Therefore, Cotton Australia has an ongoing and very close relationship with the levy payers, and it deals with immediate and current issues. It also engages a significant communications budget, part of which is aimed at promoting the activities of the organisation. Cotton Australia staff also facilitate the research advisory panels.

In comparison, the work of the CRDC as a research body is more of a long-term activity conducted by third party providers that yields results over a much longer time frame. For example the CSIRO cotton plant breeding program conducted the first cultivar cross in the mid - 1970s that produced the first commercial CSIRO cotton variety a decade later in the mid-1980s. In addition some of CRDC's research involves stewardship of existing technologies, which may

not always be perceived as being as critical to the industry's immediate needs but are critical to preserving the value of technologies in the long term.

The current system of interaction between Cotton Australia and the corporation ensures that the CRDC reports on its key performance indicators and is informed of industry R&D priorities. Cotton growers charge Cotton Australia with maintaining the industry representation of their stake in the CRDC research and adoption investment portfolio.

Cotton Australia interacts very closely with the CRDC through the development of the Corporation's five year strategic plan and the subsequent implementation of the plan through the annual budget and project investment cycles. Cotton Australia representatives serve on advisory panels that align with CRDC research programs to facilitate consistent, regular feedback and guidance on industry R&D priorities and project progress.

The CRDC has independent governance arrangements administered by the Australian Government Department of Agriculture (DA). Cotton Australia interacts with the DA administration of CRDC in a very formal manner through the selection of the independent directors appointed by the Minister every three years.

Under regulation and ministerial direction Cotton Australia as the CRDC representative organisation is integrally involved in the appointment of the selection panel for nominated independent directors of the CRDC at each board appointment round (typically every three years).

There are a large variety of different arrangements adopted in different sub-sectors of agriculture to manage consultations with levy payers, and to ensure that the views of those levy payers are accurately expressed in decisions that are made about levy rates, and the use of those levies. There is no 'one size fits all' approach that would work efficiently in every industry sub-sector, and for that reason the "Principles and Guidelines" approach adopted by the Department of Agriculture and ultimately the Minister in setting a levy remains the most appropriate way to manage these issues. Adopting a more prescriptive approach (such as mandatory industry ballots) would be unlikely to suit many sectors, and undoubtedly decrease the efficiency of levy collections.

Farm gate impacts of collective research and marketing.

One of the most challenging issues in relation to the outcomes of agricultural research and development is identifying the impact that successful research has on the profitability of the businesses contributing the levy funding. The impacts of successful research depend on a range of factors, including;

- the extent of the productivity gain arising from the innovation,
- the time-lag associated with the commercialisation of an innovation and the subsequent rate of adoption of the innovation by farmers,
- the success of farm business managers in incorporating the innovation into existing farming systems and operating environments,
- the rate of increase in productivity occurring in domestic or international farm businesses which are competing in the same market, and
- changes in relative prices for the relevant commodity or commodities over time, arising from a wide range of domestic and global factors.

Separating out all these factors in order to precisely identify the specific benefit associated with a particular innovation is a complex task, although economic modelling is commonly carried out for this purpose, based on a set of assumptions about the above variables. The large number of economic analyses that are carried out by the RDCs, both *ex ante* (to aid investment decisions) and *ex poste* (to evaluate the returns from specific projects) (see Council of Rural Research and Development Corporations, 2011) provide a theoretical assessment of likely farmgate returns arising from research, but these theoretical results are often confounded by the multitude of other factors impacting on farmgate returns.

One way of examining this question from an industry-wide aggregate perspective is to compare sector-wide productivity growth rates, with changes in farmers' terms of trade. Farmers' Terms of Trade is the ratio of the average unit value of prices farmers receive for products they sell (prices received) compared to the average unit prices of the goods they purchase (prices paid). In effect, this ratio provides an indication of the changes that would have occurred to farm profitability in the absence of productivity growth; that is, assuming that over the years, farmers continue to use the same number of inputs to produce the same volume of outputs.

The Terms of Trade data (see figure below) highlights that in the absence of any productivity growth, the average Australian broadacre farm business would have generated 30% less net revenue in 2012-13, than was the case in 1977-78. Similar data is not readily available for non-broadacre farms (horticulture, specialist crops and intensive livestock).

Average farm sector productivity growth over the same period has offset the decline in farmers terms of trade, and enabled farm businesses to maintain or improve profitability over this period by increasing output, despite the relatively lower prices that farmers have been receiving compared to the prices they pay for inputs.

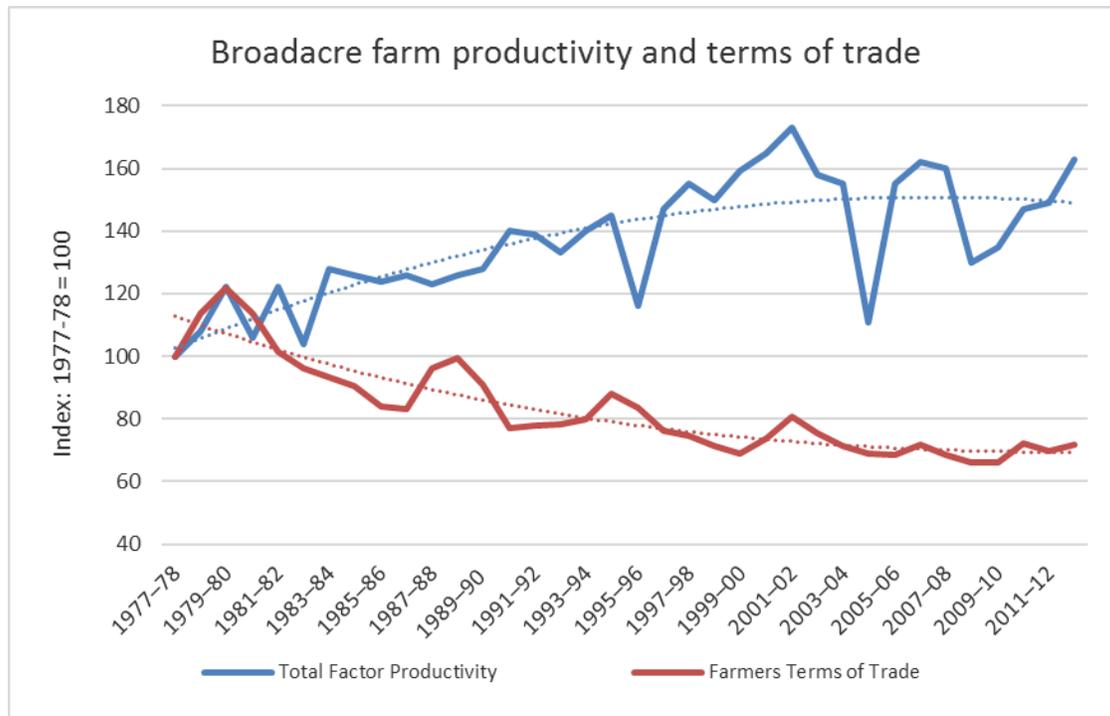


Figure 7. Trends in broadacre farm productivity and farmers terms of trade.

Source: ABARES, Australian Commodity Statistics, 2013.

While the above graph highlights the importance of productivity growth in maintaining farmgate returns for Australian farmers, it does not necessarily establish a link between the level of agricultural research and development investment in Australia, (in part funded by levies on farm production) and farm productivity growth.

Recent research by ABARES (Sheng et. al., 2011) has attempted to provide an answer to the above question. Using time series agricultural research and development data, the research utilised economic modelling to estimate the relative importance of different factors in the observed productivity growth in Australian agriculture over the past fifty years. The research concluded that the average annual productivity growth observed over the period from 1953 to 2007 was 1.96% for the Australian agriculture sector.

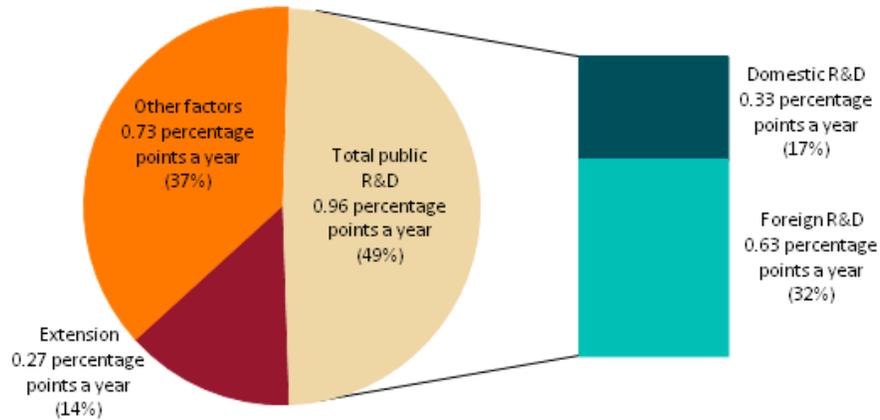


Figure 8. Estimated sources of Australian agricultural productivity growth 1953-2007.

Source: Sheng et. al. 2007.

Of this, 0.73% per annum was attributed to non-agricultural factors (improvements in telecommunications and infrastructure, for example), 0.96% per annum was attributed to public sector R&D (both Australian and spillovers from international R&D), and 0.27% per annum was attributed to agricultural extension activities in Australia. Of these factors, Australian R&D and extension activities were estimated to have contributed 31% of total farm productivity growth, although Australian extension activities would also have been significant in relation to the adoption of the results of international R&D by Australian farmers.

While the results might lead some to argue that the Australian R&D effort is insignificant and could arguably be reduced with little negative impact, it is relevant to note that of all the factors contributing to Australian farm productivity performance, the only factors that can be readily altered by the Australian farm sector (and governments) to improve rates of agricultural productivity growth are the levels of investment in domestic R&D and extension, of which levy funds are a significant portion.

This was the conclusion reached by the same researchers, who analysed the long-term trends in agricultural productivity in Australia and attempted to identify a reason for the slowdown observed post 1998;

The report concludes that a significant structural change, or turning point, occurred in the total factor productivity series in the mid-1990s. Further, it suggests that the slowdown was likely due to a combination of adverse seasonal conditions and stagnant public research and development expenditure since the late 1970s.

This study lends support to the argument that public investment in agricultural research and development has been critical in driving agricultural productivity growth in the past and highlights the important role it could play in countering the expected adverse effects on broadacre farm productivity of changing climate, increasing water scarcity and other resource constraints, and to meet the demand for food from a growing world population. (Sheng et al 2011b)

This analysis confirms the significance of public sector agricultural R&D investment and related productivity growth in improving the farmgate returns of Australian farmers.

The static trends observed in agricultural productivity growth in Australia over the past decade undoubtedly have a number of causal factors, including the decline in the rate of overall productivity growth in the Australian economy more generally. However, it is noteworthy that, despite similar or greater declines in national productivity growth in the economies of nations like the USA and Canada, the slow-down in the rate of productivity growth in Australian agriculture is much more marked than any changes observed in agricultural productivity growth in either of those nations.

The fact that both these nations have increased their share of the total value of agricultural imports by major Asian nations such as China, Japan, India, Indonesia and Korea over recent years, while Australia's share has declined, highlights the importance of productivity growth in maintaining an internationally competitive agriculture sector..

This provides further evidence of the importance of investment in agricultural R&D in Australia, recognising that levy funds are a strategically important component of the total investment that occurs.

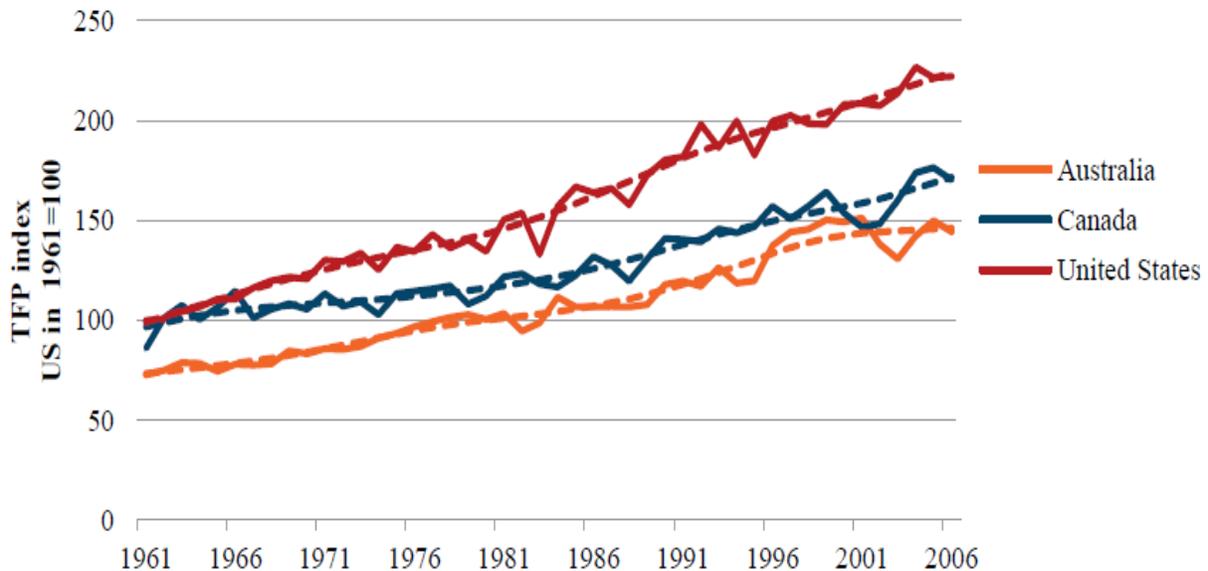


Figure 9 Comparison of Australian, USA and Canadian agricultural productivity trends, 1961-2006

(Source: Nossal & Sheng, 2013)

Collaboration on research.

One of the concerns that has been expressed about the current structure of the agricultural innovation system in Australia is that the disaggregated nature of the system (fifteen RDCs, seven state and territory government agencies, thirteen universities and the CSIRO) means that R&D issues that extend beyond the responsibility of a single organisation are likely to be underfunded. There is some logic to this concern, especially since Land and Water Australia was disbanded (the RDC had responsibility for research into issues associated with natural resource management on farms) and the Rural Industries Research and Development Corporation (RIRDC) has experienced a cut to its budget. (RIRDC has responsibilities for research into issues that affect the entire agriculture sector, as well as managing the research conducted for a number of smaller agricultural commodity groups).

The Productivity Commission (Productivity Commission 2011) proposed the establishment of a further RDC with cross-sector responsibilities as a way of ensuring that such issues gained sufficient interest from research funders such as RDCs. However, this proposal was subsequently rejected by the Australian Government. One reason may have been the realisation that the creation of yet another RDC with associated overhead costs would further drain available agricultural R&D resources, and may not necessarily improve cross-sectoral collaboration.

One reason is that one of the impediments to better cross-sectoral collaboration is the transaction costs associated with commissioning R&D by universities, the CSIRO and state government agricultural agencies. These agencies generally insist on comprehensive legal agreements as part of the commissioning process, often with extension provisions associated with the ownership of any intellectual property rights that may arise if the research is successful. These provisions can often be complex and protracted to negotiate, despite the fact that there are only an extremely small number of agricultural research projects that have ever generated significant intellectual property revenue. This can make the task of putting together a research project involving multiple parties quite complex. A second issue that can also create complexities is the question of the allocation of overhead costs by the party conducting the research. Arguments over these costs can often become protracted, especially when multiple parties are involved.

One way of overcoming some of these issues could be to develop some standardised contractual arrangements for research providers commissioned by RDCs. This would require cooperation by state government agricultural agencies and universities, which has been difficult to obtain to date.

Despite these challenges, there are numerous examples of R&D and in particular extension projects that have involved collaboration between multiple parties including RDCs, and there are many more examples in the current portfolios of RDCs. The following case studies provide a number of examples;

Case study: Grain and Graze

Grain & Graze was a joint initiative of the Grains Research and Development Corporation (GRDC), Meat and Livestock Australia (MLA), Australian Wool Innovation Ltd (AWI) and Land & Water Australia (LWA).

Seeking productivity and environmental gains on mixed farms, the program worked across nine regions in Australia with 13 catchment management authorities, a large number of producer and landcare groups and major research providers. Focusing on mixed farming systems through on-farm profitability and sustainability, catchment health, producer well-being and risk management, the program broke new ground by giving farmers what they wanted – an integrated approach to whole-farm management.

The program engaged participants in a learning model based on awareness, trialling ideas and refining these through adoption. Regional projects were supported by cross-region research (social, economic, biodiversity, feedbase management) that increased the relevance, diversity and rigor of information that producers receive.

Grain & Graze had three targets:

1. A 10% increase in mixed farm profitability, driven by a 5% increase in grain yields and a 10% increase in livestock production
2. Improved condition of natural resources on mixed farms in line with regional or catchment targets
3. Confident and knowledgeable mixed farmers making decisions and using tools that sustain production and promote biodiversity.

Grain and Graze 2 is strengthening the resilience of mixed farming businesses across Australia by helping farmers to understand complex systems, adapt to market risks and seasonal changes, and to make informed decisions to optimise grain yield and livestock productivity while protecting the environment.

The program is operating in seven regions across the mixed farming zone or wheat/sheep belt of Australia and is engaging with farmers and advisers through farm research activities, demonstration trials, fields days, workshops and publications. Grain and Graze 2 is coordinated by the Grains Research and Development Corporation and is partly funded by GRDC and the Australian Government's Caring for our Country initiative. The partners have invested a combined \$12 million into the program over the next four years supported by farmer levies and matched by the Australian Government. Funding and support from regional project partners including state departments and farming systems groups has boosted the total program investment to \$25 million.

Case Study: Making More from Sheep

A long history of investment in research and development by the wool and sheepmeat industries means that much of the information, technologies and tools already exist which allow sheep and

wool producers to significantly increase their productivity, profitability and sustainability. But the information is widely spread and often difficult to find.

The Making more from Sheep manual captures, in one handy reference, useful information about the ‘must dos’ of managing a successful sheep and/or wool enterprise, generated from years of research and on-farm experience. AWI and MLA recognise the importance of delivering on-farm knowledge and technology to sheep producers to help reduce costs and increase production while minimizing risk in an ever-changing environment.

The “Making more from Sheep” manual has been developed as part of continuing efforts to deliver on-farm knowledge and technology to help producers increase the long-term profitability and sustainability of sheep and wool production, and pave the way for a successful industry for the next generation.

Case Study: GRDC collaboration with farm groups project.

This project will form part of a national initiative representing the Northern, Southern, and Western regions. The strength of the initiative is strong linkages with research in the existing AFF research programs which will ensure direct extension, demonstration of outcomes, strong collaborative linkages, and well integrated programs.

A national network of demonstration sites, co-ordinated by key farm groups (owned and driven by farmers) in each State working in conjunction with State Agencies and CSIRO, will examine new and alternative strategies for farmers in the Australian broadacre wheat/sheep zone to mitigate the negative effects and capitalise on the opportunities of climate change on their production systems. The farm groups are uniquely situated to, not only demonstrate new practices, but also to bring awareness of the impacts of climate change and adaptations required to ensure continuing farm viability. Farm groups have direct access to other farmers, advisers, input suppliers and wider local communities.

As noted, there are many more examples of similar projects that have been carried out jointly by a number of RDCs and research partners.

References.

- ABARE 2009. *Promoting productivity in the agriculture and food sector value chain: issues for R&D investment*. ABARE and BRS report for the Rural R&D Council, December 2009.
- Alston, J. M., Pardey, P. G, and Ruttan, V. W. 2008 *Research Lags Revisited: Concepts and Evidence from U.S Agriculture*. University of Minnesota, College of Food, Agricultural and National Resource Sciences, December 2008.
- Beale, R 2008. *Review of Australia's Biosecurity and Quarantine*. Department of Agriculture, Canberra. 2008.
- Burnley J, Davis S, Lobell D. 2010 *Greenhouse gas mitigation by agricultural intensification*. Proceedings, National Academy of the Sciences, June 15, 2010.
- Centre for International Economics, 2011. *Aggressive Promotion of Australian Beef in Japan and Korea: Maintaining and developing key markets (2001–2008)*. Evaluation report prepared for Meat and Livestock Australia. Accessible at www.mla.com.au.
- Council of Rural Research and Development Corporation Chairs, 2008. *Measuring economic, environmental and social returns from Rural Research and Development Corporations' investment*. Accessible at www.ruralrddc.com.au
- D'Emden F H, Llewellyn R S, Burton M P. 2006. *Adoption of conservation tillage in Australian cropping regions: an application of duration analysis*. Technological Forecasting and Social Change. Vol 73.
- Department of Agriculture, 2009. *Levy Principles and Guidelines. Policies for the management of new and amended levies in Australia*. Department of Agriculture, Canberra.
- MAF 2002. Ministry of Agriculture and Fisheries, New Zealand. "Towards a Strategy for Using Bt toxins in New Zealand". MAF Technical Paper 2002/20. Accessible at <http://www.maf.govt.nz/mafnet/rural-nz/research-and-development/biotechnology/using-bt-toxins-in-new-zealand/>
- Mullen J D and Crean J, 2007. *Productivity growth in Australian Agriculture: Trends, Sources, Performance*. Australian Farm Institute.
- Mullen J D, 2010. *Trends in Investment in Agricultural R&D in Australia and its Potential Contribution to Productivity*. Australasian Agribusiness Review. Vol. 18, 2010.
- Nossal K and Sheng Y, 2013. *Cross-country Comparisons of Agricultural Productivity: An Australian perspective*. RIRDC Publication 13/011. 2013.
- Potard G and Keogh M, 2013. *Is counting farmers harder than counting sheep? A comparison of the Agricultural Statistical Systems of Australia, the United States and France*. Research report, Australian Farm Institute. March 2013.
- Productivity Commission 2011, *Rural Research and Development Corporations*, Report, No. 52, Final Inquiry Report, Canberra.

Rahman L., Chan K.Y., Heenan D.P., 2007 *Impact of tillage, stubble management and crop rotation on nematode populations in a long-term field experiment*, Soil and Tillage Research, Volume 95, Issues 1-2, September 2007, Pages 110-119, ISSN 0167-1987

Sheng Y Mullen J and Zhao S 2010. *Has growth in Australian broadacre agriculture slowed?* Paper presented at Australian Agricultural and Resource Economics Society Conference, Feb 2010.

Sheng, Y, Gray, EM, Mullen, JD & Davidson, A 2011a, *Public investment in agricultural R&D and extension: an analysis of the static and dynamic effects on Australian broadacre productivity*, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra.

Sheng, Y, Mullen, JD & Zhao, S 2011b, *A turning point in agricultural productivity: consideration of the causes*, research report 11.4 for the Grains Research and Research and Development Corporation, Australian Bureau of Agricultural and Resource Economics and Sciences, Canberra, May.

Sijtsma C. H., Campbell A. J., McLaughlin N. B. and Carter M. R., 1998. *Comparative tillage costs for crop rotations utilizing minimum tillage on a farm scale*. Soil and Tillage Research Volume 49, Issue 3, 2 December 1998, Pages 223-231

Silburn D M, Freebairn D M, Rattray D J 2007. *Tillage and the environment in sub-tropical Australia – Tradeoffs and challenges*. Soil and Tillage Research. Vol 97 (2) Dec 2007.

Tullberg J, Yule DF and McGarry D 2003 "On Track" to sustainable cropping systems for Australia. In 'Proceedings of the 16th International Soil Tillage Research Organisation conference'. University of Queensland, Brisbane.