AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE AND TECHNOLOGY (AIAST)

Submission to the Productivity Commission Inquiry into the Australian Research and Development Corporations

SUMMARY

The Australian Institute of Agricultural Science and Technology (AIAST) as the peak body representing agricultural professionals and natural resource managers in Australia strongly supports the current Research Corporation Model and the joint industry/Commonwealth funding formula. This view is based on the strength joint contributions to generate both private and public good outcomes.

AIAST recognises the proven importance of research, development and extension in the growth in productivity of the sector, not only in terms of its benefit to the economy but the critical role agriculture does and will continue to play in the health of the economy, managing natural resources, adjusting to climate change, sustaining rural communities, and in Australia playing its part in feeding a rapidly growing world population.

AIAST is therefore very concerned with the recent cuts by governments to RD&E investment, especially given that the industry and private sectors do not have the capacity to fill the gaps.

AIAST believes that any consideration of the RDC Model must take into account the broader environment in which RD&E operates and highlights several issues to do with the lack of vision, the image of agriculture, the lack of government commitment, the evaluation of programs in private and public good terms, the need to improve farmer decision making skills, and the urgent need to build the capacity of the agricultural profession at the undergraduate and post graduate levels.

The AIAST believes that improvements to the RDC Model can be made by confirming the original purpose, reconnecting Commonwealth, State and RDC Programs at local and macro levels, simplifying project application and reporting procedures, and retaining the current compulsory levy/fund sharing arrangement.

1. Introduction

The Australian Institute of Agricultural Science and Technology (AIAST) is pleased to have the opportunity to respond to the Productivity Commission Inquiry into Rural Research and Development Corporations in Australia.

The AIAST is the peak body in Australia representing the professions of agricultural science and natural resources management. It has over 1000 members including scientists, advisers, policy managers, consultants, agribusiness and farmers.

We provide strong, independent, balanced and factually based representation and advocacy on a wide range of issues affecting the profession and agriculture generally. In recent times these have included agricultural education, rural communication and rural research, development and extension (RD&E), including the highly successful conference "Future Directions for Agricultural RD&E" held in Canberra in March 2010.

Whilst we will attempt to relate our comments to the issues raised, we strongly believe that any fair and sensible review of the Corporations needs to be made in the total context of what is happening in research, development and extension (RD&E) in Australia. In this submission we don't differentiate between Research & Development Corporations (RDCs) and Industry Owned Corporations (IOCs).

Our overall position is that the current system is sound and that we should be improving what we have by growing the activity and doing the right things better. Those right things will have large components of both public and private good and the RD&E done needs to adequately cover the basic, strategic and applied work required. (We note that the issues paper makes frequent reference to R&D and assume that E is included – that is certainly the intent of this paper)

2. The importance of agricultural RD&E to Australia

Productivity growth in agriculture over the past 35 years has been at about 2.5% per annum, higher than any other industry except for information technology and telecommunications and was higher than other major sectors of the economy during the global financial crisis. This growth has been driven not just by new technologies but new farming systems which incorporate those technologies used in the broadest sense to include all livestock and cropping activities, in response to increasingly uncertain seasons, escalation in costs, greater price uncertainty, and shortages of farm labour. Along with increased productivity growth this period has seen some of the greatest advances in environmental care in our history including less erosion, improved water use efficiency, more effective weed and pest control, greater use of environmentally friendly chemicals, revegetation and improved livestock management and care. There is though considerable concern that the decline in support for agricultural R&D, which with the typical lags in adoption of that R&D, will mean a declining contribution from this sector with major implications for the economy.

Sheng *et al*. (2010) have recently demonstrated the important contribution of R&D to this growth and the impact of more recent R&D funding plateau. The abstract of this paper states inter alia:

Agricultural productivity has been strong relative to other sectors in the Australian economy, and relative to the agricultural sectors of other developed countries. The results (of their study) show that a significant slowdown occurred around the mid -1990s. Further analysis shows that the slowdown in productivity growth is driven by a long-term decline in public R&D investment in addition to poor seasonal conditions in the past decade.

This current Inquiry is one of many which have looked at agricultural RD&E, either directly or indirectly. Appendix 1 provides a brief summary of excerpts from a number of recent reviews. These reviews formed a background for our recent Conference "Future Directions for Agricultural RD&E". In particular we draw the Commission's attention to Report 7. This is the AIAST Submission to the Cutler Review; it deals with issues which complement and add to this submission.

This submission should also be read in conjunction with the AIAST Submission to the Rural Research and Development Council which is at Appendix 2

3. The RDC Model

The AIAST strongly supports the RDC model. The funding formula ensures that those who stand to benefit directly from research outcomes are significant contributors. At the same time it recognises that improved performance in the rural sector has significant beneficial impact to the wider community. The model ensures that the funding generated through industry levies and government contributions is effectively managed and allocated across a diverse range of RD&E providers such as universities, CSIRO, CRCs, state government, corporate and private entities.

Without the coordinating role of the RDCs both the generation of research funds and their allocation would be vastly more fragmented and unlikely to result in better outcomes.

The structure and organisation of RDCs provides for a balanced oversight of the RD&E occurring within their respective domains limiting the potential for duplication and ensuring that funds are allocated to priorities determined by those who understand the issues and challenges within their sector. Given the range of providers available to the RDCs there is the added advantage that, with significant industry oversight, funding can be allocated across activities that encompass long horizon, short horizon and immediate needs of their industry sector.

These important benefits of the model do not mean that there are not opportunities for improvement. What is important, however, from the AIAST point of view, is that we capitalize on the significant strengths of the current model and fine-tune it or adjust it to affect those opportunities. Section 6 of this submission outlines some suggested changes.

From the AIAST perspective that the RDC model is fundamentally sound this submission will now explore some of the additional issues raised in the Productivity Commission paper.

4. Rationales for government funding support

It is acknowledged that if industry alone was the benefactor of the RD&E investment the case for public contributions to funding would be weak. As we have indicated above, however, the impact of improved productivity and environmental performance in the rural sector stretches well beyond the farm gate. The impact is significant within rural communities, on the natural resources and, indeed to the nation as a whole. Immediate productivity gains may be readily measured and the return to growers may be measurable. However, it is far more challenging to measure the impact downstream, within communities, and through the better management of natural resources. What is not in contention, however, is that healthy rural communities and sustained natural resources are fundamental to the strength and resilience of the nation as a whole.

Whilst there is still some disagreement amongst the experts as to what constitutes public and private good, the general consensus is that the direct benefit/cost ratios in agricultural R&D are high, although the indirect public benefits are not always fully appreciated or achieved.

Most of the private benefits in agriculture have associated public gains because farmers are land managers, agriculture is an export orientated industry and the industry underpins most rural communities. The dispersed nature of agricultural and grazing industries, which manage the majority of the Australian landscape, results in greater public benefits than applies to other sectors of the economy. In fact, Stephens in his paper to the recent AIAST conference made the point that he could not find an outcome from agricultural R&D that didn't have some public good (Stephens, 2010). He is probably right.

AIAST is concerned that these public/private good relationships are not always understood by those who adopt a more purist economic stance and looks forward to the Productivity Commission adopting a realistic view of this balance.

4.1. Agriculture provides robust rural communities and significant natural resource management

- Despite farm amalgamations and loss due to other land uses such as urban development and national parks, there remain 126,000 farms solely dedicated to agricultural production (ABS, 2009a). These of course are the major source of support for rural communities and export wealth. Most in rural communities depend upon agriculture in one way or another.
- The farm amalgamations through structural adjustment, often in response to terms of trade, have led to larger and better-resourced farm businesses with greater capacity to adopt new technologies.
- Farms occupy 54% of Australia's land mass (ABS, 2009b) and farm businesses undertake about 90% of current natural resource management (NRM) (ABS, 2008). Most improved farming practices, the sustained adoption of which requires productive and profitable farm businesses, have a strong NRM component. NRM is a whole of community issue and it is thus appropriate that government support R&D through agriculture to facilitate improved NRM outcomes for the nation.
- Activities on farm affect the environment beyond the boundary fences (e.g. waterways, air quality, spread of pests and weeds). Supporting agriculture will also directly affect NRM by influencing the source of issues. Agricultural practices developed today almost universally have a wider NRM aspect to them. Prime examples are the impact of the adoption of no till practices in reducing soil erosion, adoption of drip irrigation on water saving and salinity reduction, and the use of more environmentally friendly farm chemicals.
- Whilst primary production produces greenhouse gases it also provides the opportunity for their reduction on a considerable scale. Investment in research is required to develop new practices and systems to implement this on a sustainable basis.
- Agriculture generates 1.6 million jobs within the industry and in related areas; 51% of these are in cities. Agriculture underpins the economy of most rural communities, especially in broad acre areas where other industries do not exist (Econtech, 2005). Both features justify government investment in agricultural R&D because it generates improved employment and social outcomes for the whole community (including 'working families').
- Agriculture exports $39 billion of produce every year which is vital for the health of the Australian economy. In addition, value adding to agricultural products adds to this total, through the manufacturing and servicing sectors.
- Basic and applied R&D contributes to our place in the world and helps developing communities to reach a sustainable existence, a well-established international goal. The

free exchange of scientific information helps us to then engage in the D&E that results in longer-term benefits. One only has to look at the activities of ACIAR to see the wisdom of this approach.

- Australian agricultural research needs to hold its own on the world stage if we want to be a major player and contribute to, and benefit from, the world pool of R&D activities and know how. Surely this has public good and particularly demonstrates to the developing world that we are a good global citizen.

4.2. Food security, quality, health and well-being

Apart from the economic value of viable and vibrant rural communities the contribution of RD&E driven advances in rural production is tangible in terms of food security and community health.

In a world sense, AIAST supports the view that the issue of food production to feed the expanding world population will be the 'greatest moral issue of our times', even more important than climate change (to which it is of course related). Australia will need to play its part in an environment where there is less agricultural land, less water for agriculture, greater seasonal variation and uncertainty, and less oil (and more expensive energy generally) with the increasing challenge to double food production that will be needed as the world's population heads towards 9 billion. Farming in the next generation faces a new paradigm that will require smart technologies and systems and this requires considerably more RD&E investment and capacity than it has at present. The easy gains in productivity occurred as a result of R&D done last century. To achieve the required gains for this century will require a higher and sustained investment in RD&E programs. Failure to play our part could threaten national security. History is littered with examples of wars over food and the resources to produce it. We can be smarter than that but only if the Australian public is prepared to invest.

At home, our food and fibre capacity is a significant contributor to the health (and wealth) of this nation. In fact, Australia is recognised around the globe as having the capacity to produce affordable, quality produce and healthy food that has immeasurable value to sustaining one of the most urbanised nations on earth. What provides us with this capacity are such things as new crop varieties, improved practices in farming systems, improvements in harvest and storage techniques, and advances in processing, and these are direct outcomes of investment in RD&E with significant benefits well beyond immediate returns to growers. Maintaining our efficiencies and sustainable production systems is a powerful rationale for government support of RD&E inputs to these critical industries.

4.3. The special case for investment in agriculture

There are clearly challenges in making an assessment of rural RD&E around private/industry benefits vs wider community benefits. Firstly, the benefits are difficult to measure. As noted above, food and fibre production have wider impact than perhaps manufacturing outputs. The benefits of Agriculture to the Australian economy are consistently underestimated as many sectors depend upon agricultural activities. Limiting R&D will affect many in manufacturing and service industries.

The private sector will fund R&D when the commercial benefits are significant, for example manufacturers of farm inputs or machinery will fund R&D that generates a well-defined commercial return. It is common for such industry to reject development proposal that cannot support end-product profitability in the short or at least medium term in excess of 40%. The structure of industries needs to be carefully considered as many of the areas requiring agricultural R&D do not fit within a simple commercial industrial model. Areas

such as plant breeding and agro-chemical development will be increasingly taken up by commercial firms, though they are looking at short to medium-term benefits. 'Pre-breeding' *i.e.* basic plant breeding studies that have higher risk / higher potential gains, tend to be shunned by such firms for Australia and requires a different mechanism. Development and adoption of sustainable practices for the dispersed farms across Australia is a vital area of need, one the public gains much benefit from but which cannot be captured at the scale a commercial firm would require.

Farming systems advances are generally far more incremental in value and frequently very difficult to justify on an industry alone basis – yet still vital to the public good. Industry diversity in the rural sector also creates industry investment challenges. It is difficult to develop a single 'product' solution to many challenges faced by rural industry, thus a pooled investment is vital, coordinated through an RDC with industry oversight. Private sector funding goes where there is significant, measurable return and the broader community benefit is not the issue.

Given the challenges faced by rural sector innovation, it is difficult to see how producers can readily offset a reduction in government funding through increased levies. The levy is already a 'cost' on production and producers are increasingly squeezed by rising input costs and commodity price pressures. While the value of RD&E is recognised by growers, the returns are slow to materialise and the prospect of increased levies is likely to be regarded as beyond their capacity.

One of the big advantages of agriculture is that farmers and communities have already provided much of the human, natural and infrastructure capital base – all we need to do is add technology (and water).

There is market failure in agricultural R&D because individual farmers cannot afford to invest in R&D, nor can they be sure of capturing the benefits – compared with mining where this is not the case.

5. Funding levels issues

The issues paper acknowledges the difficulties in determining the appropriate level of funding of RD&E from the public sector. It points out that the Commission's 2007 report was not able to be definitive on this point. Interestingly, the paper comments on the potential for public and private spending to be substitutable given the wide span of rural R&D '…from basic science through to producer specific applications of particular technologies'. In reality this occurs, even at the producer level.

The significant development of grower groups is testament to the significant investment, beyond the levy structure that producers are prepared to pay. It is worth noting here that the RDCs have been significant investors in these farming groups with excellent results. The focus of such groups tends to be on adaptation and validation of technologies for their specific application, and their extension. There is no doubt, in the view of the AIAST, that producers readily step up to the plate when they are the direct beneficiaries, and value the public contribution to support longer term, wider impacts of RD&E.

However we should not expect too much from the farmer groups in that they are (a) limited in their capacity both in terms of $$ and to provide the level of scientific expertise often required, (b) have a restricted, local view of industry needs and (c) will not always have insight into developing science that could impact their production systems.

5.1. Commonwealth, State, RDC and private contributions

A major role of government has been to fund "core capacity". The RDCs (and others) have funded at the margin and relied on the State (especially) and Commonwealth (mainly through CSIRO and Universities) to fund the core capacity of such things as research stations, laboratories and expert staff.

The requirement to source higher levels of funding support "externally" is nothing new. Universities, CSIRO and State Department programs have increasingly relied on industry funds and private sources over the past 25 years at least.

Whilst greater dependence on industry funding is desirable in terms of the relevance and adoption of the outcomes of the work being conducted, it is not without its downsides in terms of the total RD&E effort. These downsides include:

- Less expenditure on "blue sky" research which in the past has been the source of many of our important innovations. For example, research on plant water use has given rise to drought tolerant plants. RDCs mostly fund outcomes which are relevant to their stakeholders in the short to medium term.
- Revenues fluctuate widely (with seasons and prices) which hardly provides a stable long-term platform for research and for maintaining the skill base. Fig 1 in the Issues Paper demonstrates this point. There is also a counter cyclical effect in that one could argue that as the going gets harder, R&D investment should increase, not decline. In reality government contributions have declined at the same time as funds available to RDCs has declined (due to drought etc).
- Traditionally, most projects have run for three years although we are now seeing greater flexibility. For example, GRDC funds projects of duration from 12 months to five years depending on the outcomes required and will extend for further periods depending on merit. The three year project syndrome certainly causes its own inefficiencies in terms of staff productivity and stability and is given as one of the reasons why many graduates don't enter research or leave it. The agencies themselves have not developed pooling mechanisms which might manage this issue, due in part to their own tight budgets.

Much has been said about these downsides but the research bodies themselves have not been able or had the capacity to adjust to them.

It is of considerable concern in particular that State governments are cutting their budget allocations to agricultural activities, especially RD&E. In fact at national and State level, one could be excused for thinking that Governments regard agriculture as a sunset industry which is no longer worthy of investment. In SA, for example, SARDI has been cut for several years and is now expected to take a 60% budget reduction which will in effect decimate the State agricultural R&D capacity in SA.

This has meant that rather than have a true partnership as was the case in the past, industry funds are being required to contribute an increasing proportion of State costs. This is a clear case of cost shifting, which is already reducing the number of projects which can be funded. To a degree the funds are being held to ransom because there is often no other body that can do the work or it is not attractive to commercial firms.

In part, what appears to have happened is that the States are using the National Primary Industries Research Development and Extension Framework (NPIRDEF) as a 'get out of jail' card and a reason to cut their own expenditure in those areas where they are not regarded as the core ***research*** agency. This ignores the other components of the NPIRDEF agenda which are that ***development*** will be done regionally and ***extension*** locally. Both of the latter are critical to the adoption of research, regardless of its source and until recently were largely the

province of State agriculture departments. Furthermore, the important role of State Departments in training/ mentoring of new staff is declining, but is not being replaced by anything else. CSIRO has made similar decisions with the closure of horticultural facilities in Victoria and beef facilities in Queensland being good examples.

Despite the good intent of NPIRDEF, the uncoordinated cut backs have had drastic effects in industries such as horticulture where capacity in Australia overall is at critically low levels. In the case of horticulture this certainly extends to Universities where there is little teaching capacity remaining. Even in major industries such as sheep, cattle, and grains, there are declining numbers of experienced RD&E personnel to help those groups develop.

It is not possible for others such as the farmer groups or the private sector to fill these gaps. Farmer groups are just that – groups driven by farmers to meet their particular needs. The private sector is obviously driven by commercial imperatives and will concentrate on activities which make a return for shareholders. They are more attracted to research on products rather than issues. It is not sensible to expect either to fill the gap left by the withdrawal of government services (as some governments seem to expect) through some altruistic notion. Nor does either sector have adequate financial or science intellect resources to do so.

In fact, AIAST regards the reduction in core State (and Commonwealth) funded capacity as a major issue facing the effectiveness of its operations and the impact of the RD&E effort overall, with major long term consequences in Australia.

Comparisons with Overseas

To compare government funding of RD&E in Australia with that which occurs overseas is of limited value. There is potential for many factors to distort the contention that government in Australia funds agricultural research on a public to private funding ratio of 75:25. The Institute notes that these calculations do not match our perceptions and it would be helpful to understand what is captured within that estimate as there are potentially a significant number of variables and we need to be sure that we are comparing apples with apples. We believe that the figures are rubbery. Our specific areas of concern are:

- Australia has one of the lowest levels of RD&E expenditure in the OECD. Data on ratios does not take that into account. Our low level of RD&E expenditure carries with it the likelihood of Australia losing its competitive advantage. It also means a significant boost will be needed so we can start and catch up.
- Need to consider total support to agriculture not just RD&E allocations in isolation. For example overseas farmers get substantial support and protection either in terms of subsidies, tariff protection etc. whereas Australia follows the free trade option or open competition. In comparisons with the US, were the land grant universities (which are relatively well endowed) considered, or the costs of the set aside programs etc? Total taxpayer support needs to be considered - does it matter if it is a CSIRO flagship or a price subsidy??
- Do the figures include the enormous in kind contributions made by farmers to RD&E in Australia especially through our farmer group networks. We have seen nothing equivalent to this overseas. Work would be less relevant, much less R&D adopted and far less would be done if it were not for the input of intellect and resources from our farmers. Frequently, the in-kind contribution far outweighs the cash involved. Farmers overseas are involved but the group structures in Australia seem somewhat unique in our experience (eg Ag Bureaux in SA, BCG in Victoria, Liebe/Mingenew groups in WA).

- Overseas countries have more farmer participants and greater markets either within or nearby than Australia. According to our private sources, Australia is not only a small market but is high risk (mainly due to climate) and therefore less attractive to large multinational companies. We frequently hear the comment from experienced company representatives that the size of the Australia market is just too small to justify R&D programs for this market alone. Currently products are brought in from other continents but still have to be further developed here (target range, crop tolerances and rates and registration requirements can be substantially different).
- The assumption that we can just import the results of overseas R&D is a fallacy that should no longer be accepted. Except in the area of basic research, it is hard to find concrete examples of a simple importation of technology from overseas that could then be instantly applied on farms. Australia needs significant agricultural R&D to enable the importation of the simplest of overseas technologies and adapt it to our situation..
- Australia has traditionally punched above its weight in contributing to agricultural development overseas particularly in the unique contribution made by Australian agricultural science to dryland farming systems. This was shown by SAGRIC International (advice and goods sales) in the past and now by ACIAR. We need to continue to hold our own in the world agricultural science community. (Our members have been told by Chinese colleagues that their agricultural R&D engagement with China has restored faith in Australia during the recent Rio-Tinto mining scandal.)

In summary then, rather than superficially considering public investment in RD&E in cost and cost sharing terms, we should approach it from an investment perspective. We need to go beyond a simple comparison or response to the question in order to take into account total operating environments. The reality may be that Australia has it right and overseas countries are failing to invest sufficient public resources in RD&E to address the challenges of adequately feeding our future population. It is more likely, however, that the ratios of government *vs*. private RD&E investment are similar between Australia and overseas countries when you finally compare apples with apples. Overall investment on R&D in Australia, as a percent of GDP, is less than for the OECD and it may also be that this has influenced the ratios discussed. Agriculture is of major importance for Australia and should be supported at levels that exceed OECD averages.

But we should not get tied down in semantics here. The core issues remain our ability to produce sufficient food to sustain the expanding world population and that the public good benefits make government involvement in agricultural RD&E a good investment. Based on the demonstrated relationship between the decline in public investment in rural RD&E and the decline in productivity growth the AIAST does not support any reduction in public contributions to RDCs. It further acknowledges the significant contribution made by growers, beyond their levy payments, where direct local benefit is identified.

5.2. Competitiveness

One of the features of the current RDC model is that it is largely non-political. For any particular industry the levy is applied uniformly and the government contribution is by formula and easily understood.

The Productivity Commission issues paper canvasses the possibility of competitive funding. There is already competitiveness for RDC funds through tender processes with the programs largely driven by identified industry needs. The AIAST does not support a shift to competitive funding in place of funding allocations managed through RDCs and industry input. Competitive funding has the potential to become political, provide results for those

with influence and power and target 'big ticket' items rather than incremental growth that is so important and a characteristic of rural RD&E. It would be damaging to lower profile segments of the rural industries to move in that direction.

That is not to say that the government should not, as a joint partner, have strong input into the strategic direction of the investments. It has that opportunity now through regular meetings between RDC's and agencies (especially DAFF). However, for the government to be effective in this role, they need to clearly enunciate their policies and preferred directions. Apparently this input is currently lacking with a tendency to make policy (and associated RD&E investment decisions) on the run. This is also covered under section 6.2.2 of this submission

5.3. Suitable projects

There is little evidence to suggest that RDCs have difficulty in identifying projects for investment. If there are constraints they have more to do with the management of the complex diversity of projects and access to sufficient providers. Both of these constraints need careful evaluation, some of which is beyond the scope of this inquiry. A critical issue impacting researcher capacity is related to the research funding models common in Australia, not only through RDCs. Funding life cycles, to a very large degree, drive researcher appointment terms. With a high proportion of project allocations based on three or sometimes five-year terms, researchers and support staff face continual uncertainty in terms of job security, location and professional development. There is good evidence that this leads to loss of capacity, particularly in early and mid-term career stages. While this phenomenon requires deeper analysis elsewhere there is no doubt that the RDCs and those who jointly fund with them are caught up in this dilemma.

5.4. Balance of funds across RDC's

Determining the balance of funds across RDCs is recognised as problematic. The AIAST has presented a view that the rural industries in general are deserving of public funding due to their immeasurable contribution to the wider community and the incremental nature of industry development and return to producers. With this rationale it may be seen as appropriate that there be some variation between RDCs in the way in which funds are allocated. We do not propose a reduction in any area but suggest that the case is made for increasing allocations of public funding where three important criteria exist:

1. The contribution to public good is greater than in other RDCs, or where it is clearly in response to current government policy.
2. The industries concerned are more fragmented
3. There is significant industry innovation or emergence of new industries

For example, RIRDC and HAL have very fragmented industries where it is difficult to distribute funds relative to industry contributions. There is a possible case for RDCs with such diversity and broad community benefit to be funded at a premium level.

It is also recognised that new innovation and new industries require greater investment input and are higher risk than in established industries. Where these opportunities will ultimately contribute to similar community benefit as they become established there is an argument for additional seed funding.

5.5. Access to commercial funds

A possible substitution for government investment in R&D is to access commercial funds through partnerships with commercial entities. Outside of the RDCs such partnerships have developed in recent years with CSIRO, for example, sourcing significant R&D funds through commercial partnerships. CRCs are structured specifically to engage with commercial partners, successfully boosting access to expertise, commercial funds and commercialisation strategies. To some extent RDCs are participating in such partnerships through their involvement in CRCs and in some cases direct commercial partnerships. Whilst there is room for these arrangements in the RDCs, the AIAST does not see it as a suitable model for core RDC funding. We hold this position because we identify important weaknesses in the context of the RDCs' focus on broad industry development. Commercial partnerships are appropriate where the outcomes can be captured (such as in plant breeding) and where there is wider industry and public benefits. In this case the rewards are often shared in the same proportion as the investments.

6. So what does the AIAST suggest?

There are clearly two sets of issues: – those which address the Broad Environment in which RD&E occurs, and those which are specific to Improving the RDC Model

6.1. The Broad Environment

6.1.1. Need vision for agriculture and agricultural RD&E in Australia

One of the important outcomes from the AIAST R&D Conference was the realisation that there is no clear vision for where we want agriculture to be in this country, let alone RD&E. Is it little wonder we seem to lack direction and move from review to review without any understanding of the end goal or a commitment to it?

As a result we tend to deal with second order issues like who pays rather than the core issues of improving efficiency in meeting the goals we want and how Australia can build on its strengths.

This might, on the face of it, appear outside of the terms of reference for this review, but what could be more important than an appreciation of where we want to be.

The AIAST has already started addressing this issue and will have a draft paper available shortly.

6.1.2. Need to reposition agriculture in the minds of the public

Again, this is something that might appear outside of the terms of reference for this review, but is an essential component of the environment within which changes will occur (or fail to occur).

The common picture painted by the media and some industry groups is one of agriculture which is perpetually in trouble and reliant on handouts from taxpayers which are not expected by or provided to other small business.

There is little about the importance of agriculture to the economy, to the natural resource management or the community – all those public good benefits outlined in Section 4 above.

So it is not surprising that agriculture seems to have dropped off the radar of governments who seem increasingly reliant on mining as a source of wealth. In fact it would seem that some regard agriculture as a sunset industry which is no longer worth sustained public investment, at least by some State governments. The contribution of agriculture to sustaining

the economy during the global financial crisis seems to have been recognised by the financial media but not by governments.

This perception must be changed and changed quickly and again the AIAST will be leading this process along with other key bodies. The process is already underway.

6.1.3. Commit to public expenditure at Commonwealth and State levels

The importance (and urgency) of this is outlined in section 5.1 of this paper.

There is an urgent need for PIMC/PISC to suspend their current activities in establishing a National Primary Industries Research, Development and Extension Framework and take a fresh look at what is happening at State and Commonwealth level, especially how what has been and is happening diverges from the original agreement signed by the Ministers. While PISC has been trying to create efficiencies, governments have been cutting resources to the point that in many cases there is little left with which to create efficiencies or a new "framework".

To say that we face a crisis is not putting it too strongly. It is a national issue which PIMC/ PISC can and should address. Regrettably, the representatives on those bodies are the same Ministers who are calling for the cuts and the same public servants who are required to administer them.

Yet if PIMC/PISC does not address this issue, we would question whether the current work being done by them and the Rural Research and Development Council is fast becoming irrelevant. One would also hope that the Productivity Commission might play its part by highlighting this issue.

6.1.4. Greater attention to evaluation

There are several forms of evaluation each with a different purpose. For the scientific community, refereed papers in recognised Journals are important and used by the agencies to evaluate individuals and programs, and in securing government funding. They measure science quality and outcomes without necessarily reflecting practical end use. This can be appropriate for the more basic / strategic areas of R&D. For example, the ARC is not very interested in applied outcomes, only publications. The current Excellence in Research in Australia guidelines are all about quantity and quality of scientific publication in up-market journals.

RDCs on the other hand are very much about outcomes and their benefit to stakeholders. However, we still see processes dominated by the need to adhere to KPIs and budgets rather than the value of outcomes and their adoption not just on production but on the environment, the community and on informing government policy.

The requirements of the RDCs and those who employ those doing the research are often different. This can lead to conflict which needs to be resolved.

Post project evaluation is very complex given that the adoption of R&D in the agricultural sciences has a wave of impacts directly at the producer level, within regional communities and at the national level. When we accept this as a rationale for public investment in RD&E we also accept that measurement is likely to be fuzzy. This is not to say that we should be ambivalent to evaluation but to try to bring the impact of this type of RD&E investment down to statistical analysis in benefit-cost ratios and other quantitative measures can result in limited or, even worse, erroneous conclusions. It might be possible to measure productivity at the farm gate, returns to producers, even changes in environmental impact. But because these measurable advances are often incremental they often do not reflect the real value of

productivity gains and practice change. The real gains are often qualitative and extend beyond the farm gate.

There have been recent studies conducted to evaluate the contribution of RD&E emerging from the RDCs. The issues paper makes reference to these studies that demonstrate a favourable return on investment. These studies recognise that the impact of RD&E is widespread and that producers are not the sole benefactors of the gains.

What is perhaps more important to measure as a post-evaluation is rate of adoption. Studies on return on investment do point out that often the uptake of technology change is slow. In a strictly commercial sense, one of the most effective ways to increase return on investment for R&D is to speed up the rate of adoption. Unfortunately adoption strategies are frequently poorly defined in much of the publicly supported R&D, including that done by the RDCs. Too often, no one wants to take responsibility for adoption strategies in terms of specific funding. The R&D phase focuses on the utilisation of funds for the physical and practical R&D with no allocation to adoption plans. More recently we have made important improvements in that projects are now expected to define ways in which the work will be extended. Unfortunately we still often fail to budget adequately for extension activities and frequently extension is about the delivery of information based on a simplistic technology transfer notion, rather than a defined adoption strategy. Even less attention is given to evaluating the market for the information products and assessing the factors which will drive or constrain adoption.

The AIAST believes that as part of a post project evaluation program there should be more attention paid to defining adoption strategies and ensuring that these are built into projects from instigation with a budgetary allocation. This means that adoption goals can be set which then becomes a more useful mechanism for evaluation.

Meaningful evaluation represents several challenges:

- It can be resource demanding and most people prefer to press ahead with the new project with potentially exciting outcomes than spend tome of properly assessing what they have already done in impact terms.
- It requires special skills and methods which are in very short supply both within service providers and RDCs.
- It is really a branch of research of its own which requires separate consideration and funding as a cross sectoral issue.
- A clear appreciation of the outcomes and how to best measure them is something which should be (but rarely is) an integral part of planning.
- Evaluation needs to consider the next steps in R&D as no project would ever answer all the problems.

The importance of evaluation as an essential component of project design and funding was identified at the recent AIAST R&D Conference and should be the subject of further development.

The degree to which that happens will itself depend on resources and support from industry and agencies will be required if AIAST is to do this effectively.

6.1.5. Improving farmer decision making

In any consideration of RD &E we need to constantly remind ourselves that little is gained unless the outcome is adopted (except perhaps for some kudos to the scientist through such things as papers in scientific journals).

It is of course the farmer who makes the decisions with regards the adoption and in doing so faces a complex array of issues and options. The new piece of information from research is just one (and often a relatively small) component.

They make their decisions within the context of their farming system, and are driven largely by profitability, sustainability and risk management considerations. In fact it is the farmer skills (or those of their adviser), based on knowledge and experience which drive the process, which includes off-farm as well as on-farm factors.

A better understanding of how and why farmers make decisions is central not just to effective evaluation but deciding on what needs to be done in the first place, be it in research, development or extension. In many respects it is more aligned to market research whereby we better understand the market for what are essentially information products.

This is an essential part of the RD&E environment with impacts on production, the environment and the community. However it is grossly under resourced and in fact is not even considered by some as research.

Again it needs separate consideration and represents a cross-sectoral issue that could result in major gains to the industry and environment.

6.1.6. Research and evaluate how best to encourage investment by private companies in RD&E in Australia

Australia benefits from substantial research done overseas, especially in the areas of chemical inputs and machinery, but Australian agriculture has unique differences which require local adaptation which we can capture almost exclusively because of that very uniqueness of the environment. On the other hand, our market is relatively small and, because of our variable environment, is also high risk. Both characteristics discourage work in Australia. This can result in products not undergoing the necessary local testing required not just for farmers but for the product to be registered for use. This limits farmer options.

So the question becomes, are there sufficient incentives (apart from commercial gain) for companies to do this work and, do the government processes for such things as product registration discourage such activity?

AIAST has not canvassed this widely but it is an important issue if government is to expect greater contributions from the sector.

6.1.7. Building Research, Development and Extension Capacity

The AIAST has for many years been concerned by the lack of people electing to study agriculture both at undergraduate and post-graduate level. The profession and industry has already reached a crisis point where we generate less than half of the number of graduates required.

This represents one of the most serious limitations to agricultural growth and needs to be addressed urgently. It is not just a situation that supply / demand forces will address in the time frame required.

The reasons for the shortfall are many ranging from the poor image of agriculture, to rates of pay and the difficulties to get secure medium to long-term employment (especially in

research with short term contracts). Our experience is that many of the best and brightest students who choose agriculture or who have an interest in working in rural problems reject R&D because they see no security for the future.

The shortfall cannot be met simply by bringing skilled people from overseas, especially for applied research, development and extension because our systems and technologies are unique to our environment. In this regard, agriculture differs from other professions such as medicine or engineering. Shortages don't just exist in research but in other sectors such as consulting and agribusiness, although these areas have recently been a preferred career path over research.

We are conscious that a positive, leading edge view of agriculture would attract many of the best and brightest, as it did in the past, to tackle the manifold problems that need to be solved this century. Revitalising the R&D system so that students can see a viable future is an essential part of ensuring agricultural R&D has a great future.

Several actions are required:

- Improve the image of agriculture and its importance so that it becomes a more attractive study option.
- Continue to support the Primary Industry Centre for Science Education (PICSE) program, working with young people in schools to excite them in the sciences, including agriculture.
- Provide special consideration to agriculture in terms of funding for Universities Schools of Agriculture, and for HECS fees charged to students. These steps are taken for other professions in which there is a shortage, and needs to be adopted urgently for agriculture.
- State agencies, CSIRO, Universities adopt a pooling arrangement in order to retain employees who might otherwise leave because of the insecurity of the short term contract situation.
- Those involved in employing agriculturalists develop cadetship programs to encourage young people into agriculture and meet at least part of their study costs.
- The salaries to students, especially post-graduates be reviewed and increased.

Without these steps, the falling number of professionals in agriculture will become one of the major constraints to development of the sector and the economy – if it hasn't already.

6.2. Improving the RDC Model

To create and manage a structure that works effectively over a range of diverse industries and RD&E demands will always be challenging. It means that there will always be opportunities for improvement or fine tuning, but as a framework for meeting the needs of industry RD&E, the AIAST supports the current model. In exploring opportunities for improvement the Productivity Commission issues paper raises areas of purpose, collaboration and coordination, governance, administrative efficiencies, and levy arrangements. This submission will comment on these areas individually.

6.2.1. Revisit the original purpose of the RDC's and their structure

It is clear that the original intended scope of the RDCs was research, development and extension.

In fact the PIERD Act states:

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

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

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

In practice, however, it would appear the amalgamation (especially with IOCs) with marketing functions (rather than knowledge as provided for under the Act), promotion and even industry representation functions has caused confusion and detracted from that initial role. Certainly there would seem to be less justification for public support for at least some of these roles which are more likely to have greater private benefits in the case of the increasing privatised marketing and promotion operations. In the case of more political activity, costs should be met by industry. The original intent is as sound today as it was when the RDCs were formed. Certainly any changes to the model need to take into account that initial purpose. The AIAST believes Australia set the standard when the current RDCs were initially established. Restoring a clear focus and developing them further is the way forward.

We would also support selected, skills based Boards whose first obligation is to do what is best for "the business", free of undue influence from any particular sector. Whilst it is understandable that farmers want to have substantial say over how their levy is spent, this is best be served by a balance of skills, based on current needs, which would include farmers.

We can also see the case for government presence on Boards but they too must bring required skills and knowledge rather than just be a watchdog. It is important that they are of sufficient standing that they know and are able to bring to the Board, the current thinking of the Department(s) and political thinking of the day, as well as being able to feed to their masters the thinking of the Board. In that way there is a greater chance of research informing policy. That having been said they must, like all Board members at all times act in accordance with the rules of good governance. It must be a relationship built on two way communication and trust, neither of which appears to be very common currently. We need to break down the isolation and avoid programs which simply (but expensively) respond to knee jerk policies.

6.2.2. Coordination and Collaboration

Duplication of effort is wasteful of resources and frustrating to those both engaged in research, funding bodies and the recipients. There are no solid boundaries between rural industries and indeed, most individual producers are active in multiple enterprise activities that require the integration of various industry practices into whole farm systems.

If planning mechanisms are sound then opportunities for collaboration should be readily identified. RDCs should cultivate in their people and through their industry engagement a mindset for collaboration. This can be facilitated by effective interaction between RDCs with related interests. Significant progress has been made in recent years with a number of collaborative projects involving several RDCs e.g. Grain and Graze.

It may warrant special RDC type arrangements. As an example the Climate Change Program led by the then Land and Water Australia was far more effective from an RD&E perspective than the current uncoordinated approach.

Reconnect Commonwealth, State and RDC Programs and Initiatives.

There is a suggestion in the issues paper that collaborative projects might provide '…lesser return than other project options….' Effective collaboration should, in fact, have the opposite outcome. Effective collaboration should provide outcomes greater than the sum of individual 'silo-based' activities, specifically in terms of adoption. One of the key challenges of technology adoption is that for effective adoption to occur the technology package must find a close fit with the farming system. When producers are dealing with multiple enterprises, silo-based research has limited adoption potential, whereas collaborative programs will have much greater potential to address the whole system needs.

Coordination of planning, funding, management, conduct and reporting in an environment as complex as agricultural RD&E is a real challenge but provides enormous potential for efficiency gains. Determination of what work needs to be done and how, should be given greater attention rather than the preoccupation with who pays. Who pays can emerge from developing a strategy to solve a problem, rather than being initially prescriptive. Resolve is needed though to pursue a renewed level of agricultural RD&E for the reasons outlined earlier.

The Issues Paper raises cross-sectoral requirements but the opportunities run deeper than that and we believe that it should be addressed at two levels:

At "ground level"

Under the current system a decision about what work is to be done comes from several sources:

- Researchers and managers from government agencies (often strongly influenced by the personal interests and experience of the researchers or the agency),
- Policy units of government who are often responding to political pressures
- RDCs themselves (some of whom have extensive communication networks up and down stream, some don't)
- Farmer groups, individual influential farmers and private consultants (very aware of local issues but often do not have a strong overview of the whole industry or science area)
- Private companies (whose primary responsibility is to their shareholders or owners).

It is little wonder therefore that we frequently see inadequate definition and prioritising of the issues, poor coordination, poor cross-sectoral cooperation, and programs which fail to address the most important questions and result in not achieving the best value for money.

We recommend that **panels** be formed to coordinate the applied RD&E. These panels would be based on major agricultural ecological zone (or collection of similar zones) encompassing all relevant players. This would include farmers, scientists and advisory staff from all sources, NRM managers, consultants, agribusiness, RDCs and Government agencies. Panels could cross catchment and state boundaries. Each panel would have an executive officer, who participates fully in the panel business and is responsible for planning and follow up processes. This person would need to be knowledgeable and competent in the systems of the area and in RD&E. Each panel would:

- Have an in depth understanding of the environment in which they are working from the diverse representation of the members.
- Define the issues of importance for improved farming and the resource environment they operate within, in the zone.
- Define the key questions to be considered for each issue.
- Research what work has already been done on each issue.
- Decide how much research, development or extension work is required to overcome each issue.
- Plan and decide who is best suited to do the work and how to fund it.
- Commission smaller works to be done and make recommendations to funding bodies for large programs.
- Evaluate the value of the work in terms of scientific goals, likely adoption by and impact on farmers and value chains, benefit to the community and to the environment.
- Establish an information hub containing the results of all work done in that zone.
- Monitor progress of activities.

Such an approach is very challenging but will overcome many weaknesses in the current system. It would:

- Confine the field of planning to a zone which people understand, and makes the process manageable.
- Be a bottom-up approach which is informed by the best science input available. It has the best chance of overcoming the issue of "not knowing what you don't know" for all parties.
- Provide for a whole farm system approach by which the needs of the individual enterprises can be brought together as a package. It provides the link between agricultural production and natural resource management issues at the regional level. In fact, it may replace NRM Boards, many of which seem to be struggling at present.
- Bring together scarce intellectual resources across a broad spectrum. In fact, it would provide the means by which the scarcity of experienced scientists can be partly overcome.
- Identify the core issues and processes using the best skills from a range of disciplines and knowledge available.
- Inform those who make policy of the better RD&E initiatives with the benefits of a more integrated approach.
- Provide the opportunity for better quantification of the benefits of doing particular work.
- Determine who is best equipped to do the work, the partnerships required and who the most appropriate investors are.
- Ensure the development of a clear adoption strategy to facilitate rapid uptake of new practices.
- Provide the basis for effective evaluation of outcomes and on going identification of further work and investment required.
- Provide an information hub of all work done in that zone.

There is no question that this will be a complex process and won't be easy, but it would be less complex than the current system of many agencies, farmers, firms, RDCs etc., all attempting to do similar tasks within their own territory without coordination. But it does offer a practical means by which many of the problems with the current planning approaches can be addressed and warrants serious consideration.

At the "macro" level

The issues are not just about the relationships between RDCs. We face the big issues such as food security, energy security, water and climate which whilst they have an important contribution to make are probably not best dealt with by commodity specific entities. These cross-sectoral issues require a broader approach to integration, public funding and RDC contribution. These issues are not often confined to one agro-ecological zone and can require an extended period of basic research to understand the system before applied solutions can be resolved.

John Kerin, the former Minister for Primary Industries and Energy (and father of the current RDC Model), in a recent address to University of Melbourne highlighted the need for wider consultation outside of the "silos" and suggested a pool of Departmental professionals who would be tasked to advise governments on general research priorities for RDCs to include in their portfolio.

To some this will smack of bureaucratic control and another layer of management but that need not be the case particularly if it can replace other mechanisms. The assumption here is that you go for the best people, more so than each component acting independently.

If this group included those from government who sat on RDC Boards plus others who were selected for their knowledge and skills in RD&E and industry, and had the role of providing advice, rather than management, it could be a way of bringing the parties together and better informing the policies and programs of each.

Perhaps it warrants a special purpose RDC.

Certainly we must address this issue of breaking down the silo mentality not just with RDCs but, equally within governments if we are to make best use of our scarce resources.

6.2.3. Governance

It is important for the RDCs to maintain strict governance regimes and accountabilities to stakeholders.

The RDC model was not created to meet government research priorities. That is not to say that the RDCs must not be accountable to government as a key funding partner. But that accountability must lie in generating public good from investment in RD&E, not in meeting specific government research priorities as they relate to the policy demands of the day. It is important that the strategic and operational plans, in the first instance be framed around respective industry priorities. This would give greater sense of ownership and clarity of direction from the perspective of producers and still provide the means by which government could meet its public good agenda.

The Board representation (Section 6.2.1) and adoption of the "panel" approach (Section 6.2.2) are important components of this.

6.2.4. Simplification of project application and reporting procedures

There is a fine balance between achieving transparent accountability and creating bureaucratic structures that impede efficiencies. Many of the RDCs currently suffer from

costly processes that are implemented to ensure that transparency exists in project prioritisation, selection of providers and reporting procedures. These processes are a significant overhead, not only on the RDCs themselves but on providers as well. One of the greatest costs (and frustrations) is the amount of time spent on applying for and reporting on projects. This is time which could be spent on more productive endeavor.

Each project stage is impacted:

Project prioritisation: Requires extensive review by multiple stakeholder groups, committees and reviewers. Projects are designed to meet known prioritisation criteria, so may not truly reflect industry needs and the process itself can mean a slow response to industry needs.

Selection of providers: Normally occurs through a tender or project submission process that requires that a project be made to fit into multiple selection criteria. In many cases this process is sufficiently complex and time consuming to deter potential providers, particularly those in the private sector, from engaging with the RDCs. This creates an unfortunate loss of access to expertise.

Reporting procedures: Are often constructed around unrealistic milestone achievements rather than reporting of actual progress. This forces a pre-emptive project plan which may become inflexible due to the uncertainties of science or the situation in the field. But to maintain the planned project cash flow project reporting can be driven towards meeting milestones rather than resolving hurdles.

It is difficult within the scope of this submission for the AIAST to propose solutions to these inefficiencies but recommends that RDCs review, with the involvement of service providers, many of their procedures in project management to overcome their obvious overheads in these areas. The objective should be the facilitation of the research rather than rigidity in process that stifles innovation and presents barriers to participation in RDC programs.

6.2.5. Improving levy arrangements

The issue of levies has been discussed above. The AIAST simply reiterates that the current system of levy collection (in most cases, compulsory) is effective, well-balanced and provides a sense of individual commitment to R&D and, with matched government contributions, a sense of recognition that producers play a role in community well-being beyond the farm gate. While there are individual RDCs that have issues regarding levy rate setting, they are generally isolated and connected to issues beyond the specific industry productivity.

We do not support the adoption of a voluntary levy model. RDCs obviously operate large and diverse programs in complex need environments with all the issues of communication across States, and often many sectors.

To use a voluntary system at national level will inevitably invite more “free loaders”, a situation the RDC model with its compulsory levy was set up to avoid. In our view, the need for a compulsory levy at national level is as sound now as it was then.

7. Conclusions

- An increase in RD&E is essential to the continued growth in productivity of the agricultural sector and the economy.
- The Research Development Corporation Model should be retained.
  It is sound in the way it provides a balance of private and public investment to achieve both public and private good benefits.
- There is a strong case for the continued investment by governments in agricultural RD&E, not only in terms of the proven benefit/costs per say but in the manner in which improved agriculture contributes to the goals of government in terms of wealth generation, meeting our obligations in feeding an increasing world population, care of the nations natural resources, and maintaining the strength of rural communities.
- The reductions in government investment in recent years has not only stifled productivity growth but resulted in less work on "blue sky" research and in development and extension.
- Comparisons with what is happening overseas are unhelpful unless the total assistance to agriculture is considered.
- Whilst increased investment in private sector investment is unlikely to "fill the gaps" left by reductions in other fund sources, there is a need to investigate with the sector how the constraints to private investment might be overcome
- There is little to be gained from increasing competitiveness in the project bidding process, especially from adopting separate processes for the industry and Commonwealth components.
- There is no evidence that the current project selection processes are limited by a shortage of projects.
- There is a possible case for additional government support for that RD&E where the public good benefits are greater (and respond to current policy), the industries concerned are fragmented, or where there is significant innovation or emergence of new industries.
- Any consideration of the RDC Model needs to take into account changes to the broad environment within which they operate:

    - The need for a clear vision for agriculture and RD&E in Australia.
    - The need to reposition agriculture in the public mind in terms of its economic, natural resource and social contributions.
    - The need for an increased commitment by governments to fund agricultural RD&E.
    - Greater emphasis on the evaluation of programs, especially in terms of the measurable contribution of the outcomes in private and public good terms.
    - Greater emphasis on development (D) to adapt research to farm systems, and extension (E) to relate those results in a form which farmers can adopt.
    - Improving farmer decision making, including financial and risk management, so that there is greater adoption of the outcomes of research.
    - The need to urgently address the need to build research, development and extension capacity at the undergraduate and post graduate student levels.

- In improving the RDC Model consideration be given to:

    - Confirming that the prime purpose of RDCs is in RD&E.
    - Appointment of appropriate government representatives to RDC Boards who would act as the interface between government policy and programs, and the RDCs.
    - Reconnecting Commonwealth, State and RDC programs and initiatives at:
        - "Ground" level through the formation of composite panels based on agri ecological zones.
        - "Macro" level panel with representation from the various related RDCs
    - Retention of governance arrangements which continue to emphasise industry priorities but in terms which better recognise both private and public good
    - Simplifying project application and reporting procedures.
    - Retention of the current compulsory levy and industry/government formula arrangements.

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APPENDIX 1. SUMMARY OUTCOMES FROM THE AIAST CONFERENCE "FUTURE DIRECTIONS FOR AGRICULTURAL R, D & E", 2010.
Media Release.

RESEARCH CONFERENCE HIGHLIGHTS FOOD NEED

The recent Australian Institute of Agricultural Science and Technology Conference held in Canberra highlighted the challenges facing agriculture in producing enough food to feed the world.

World population will reach 9 billion by 2050 and require a doubling of food production just to maintain today's standards.

National AIAST President Geoff Thomas said that this will need to be achieved with less land and water for agriculture, less and higher costs for fuel and chemicals, and in an environment where seasons became more difficult.

With the publicity on things like climate change, the importance of food security had been less well publicised, despite the fact Australia has a responsibility to meet the food challenge just as much as it breeds to play a role in things like greenhouse gas reduction, Mr Thomas said.

To meet the food challenge Australia needs to develop smarter technologies and systems and that requires far greater investment in research, development and extension. However governments had reduced investment in this area as they give preference to such things as health, education and welfare. It is time to rethink this approach, Mr Thomas said.

Agricultural production had grown by around 2.5% per annum (which is the highest of any sector apart from telecommunications/IT) but has flattened off over the last ten years. Evidence presented to the Conference showed that a major cause of this decline is a drop in R&D investment.

Peter Kuhlmann, Chair of South Australian Grains Industry Trust, who along with Australian Grain Technologies and Aust Centre for Plant Functional Genomics were among the sponsors for the Conference, said, "we have been living off of the stock of results from past research and it is now urgent that we replenish it".

Farmers are making a huge contribution through their levies but they can only do so much without government support by way of research infrastructure, including a pool of experienced scientists to lead the work, Mr Kuhlmann said. One cannot expect industry to pick up all of these costs given that it is not just farmers but the whole community which benefits.

Mr Thomas said that winning investment in research RD&E was not easy in the current political environment and required not just the AIAST , but all groups involved in the industry to:

- Establish a clear and single vision for agriculture so conflict in the messages was avoided.
- Adopt a fresh approach to communicating to the public the importance of agriculture to Australia and the world in terms of:
    - Meeting the food challenge in terms of volume and food safety
    - The role of farmers in managing the environment with 54 percent of our land being managed by farmers, 94 % of who actively undertake natural resource management.
    - The role of agriculture in managing green house gases
    - The importance of agriculture and related industries which support 1.6 million jobs, 50% of which are in the cities.
    - Maintaining rural communities which are central to our cultural identity. While the number of farmers has fallen there are still 125,000 farmers dedicated solely to agricultural production, and which in most cases are the mainstay of their community.
- Work together in selling the importance of agriculture and increased investment to the community and to governments.

Mr Thomas said that while many issues came out of the Conference which must be addressed, this “repositioning” of agriculture in the public mind was one of the most urgent and where AIAST would take an important lead.

APPENDIX 2. SUBMISSION FROM THE AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE AND TECHNOLOGY TO THE RURAL R&D COUNCIL - NATIONAL STRATEGIC RURAL R&D INVESTMENT PLAN

The Australian Institute of Agricultural Science and Technology (AIAST), as the peak body for agricultural professionals in Australia, rather than respond in detail at this stage through the questionnaire, wishes to make the following points:

NATIONAL R&D STRUCTURE

- The structure of Australian Rural R&D is complex.

CURRENT RESOURCES AND RESOURCE SHIFTING

- There seems to have been a progressive shift of R&D funding from the States to the Commonwealth and RDCs under the guise of "reducing duplication through institutional consolidation to provide critical mass" in a process carried out under the aegis of the Primary Industries Standing Committee (PISC). This has allowed the states to pull out of research in some areas.
- Hard figures are needed to identify the current levels and trends of investment and by whom. There seems to be a lot of folklore and spin and a shortage of real facts. (In addressing the issue of adequacy of Agricultural Education, the AIAST found the same problem – in fact the figures from the then Department of Education Science and Training were grossly misleading).

CAPTURING INTELLECTUAL PROPERTY RETURNS

- The movement of some aspects of agricultural R&D into intellectual property protection and revenue generation has resulted in less public funding in those areas. The area where this has been most successful is in plant breeding where IP returns can be captured from newly available improved varieties.
- The ability to capture IP returns in other areas of agricultural production is considered to be over-rated.

NATURAL RESOURCE MANAGEMENT

- There has been a general progression from governments funding production agriculture to funding research relating to environmental protection and resource management in agricultural systems, an area where it is unlikely that IP revenue can be captured from research.
- Environmental/natural resource management research was encouraged by the former Land and Water Resources R&D Corporation (Land and Water Australia - LWA) which by attracting co investment from the production based Research and Development Corporations (RDCs), led to a heightened awareness of NRM issues among those RDCs.
- LWA was in consequence abolished for its trouble – a particularly short-sighted decision in the light in much wider awareness of environmental issues including drought and climate change now extant in the farming and general communities.

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AVAILABILITY OF NEW TECHNOLOGY – "EXTENSION SERVICES"

- The Primary Industries Standing Committee (PISC) process clearly states that whilst there will be a national emphasis on research planning for industries, the development and

extension components will remain the responsibility of the States. It is therefore regrettable that some States have withdrawn regional capacity even before the PISC process is finalised.

- Our contention is that there needs to be a better balance between research, development (in-field adaptation of findings) and extension. One could argue that there is still a lot of mileage to be made out of existing research information but it needs a shift in emphasis. Of course it also involves different players with different skills. Despite the fact that it should be obvious that the end game should be practice change rather than the generation of information per se, our structures and processes don't cope with achieving the balance. Maybe this is because much of the policy etc is driven by research or by others who lack real world understanding.
- An area which has been seriously under-funded is the related area of farmer decision making and the management of profitability and risk. These are the modern drivers for farmers rather than production per se. Skills training and research funding in these areas are very small, but are slowly coming onto the radar.

THE "PURCHASER-PROVIDER" MODEL

- There has been a flirtation to a greater or lesser extent by most states in the "purchaser – provider" model. While this generates increased focus on priority setting for outcomes, it does have an offsetting risk of inhibiting creativity among science leaders, particularly where the priority setting is carried out by bureaucrats remote from both the science and the industries involved.
- Some of the processes of experimenting with the "purchaser – provider" model have served to act as a distraction to maintaining research momentum.

COLLABORATION

- There has been a widespread constructive adoption of collaborative research across institutional boundaries, particularly in the Cooperative Research Centres program.
- Successful collaboration requires clear messages of commitment from the "top", and where this has lapsed, there have been some examples of recidivism into tokenism in the collaboration between organisations.
- One of the biggest needs is to have a collaborative approach by the funders of R&D both between themselves and with the relevant Commonwealth Departments. At present there seem to be few linkages and potential for inconsistencies between the RDCs, and Commonwealth Departments. Previous links have been discarded. This results in mixed messages to the providers and scope for waste of valuable resources.
- There has been an increase in the use of matrix management systems. Unless very well designed with clear lines of communication and responsibility, such systems can lead to confusion and loss of focus.

THE CHANGING STRUCTURES AND OPERATIONS OF THE RDCs

- From the passage of the Primary Industries and Energy Research and Development (PIERD) Act 1989, most RDCs became restructured in the "Corporation" model with Board members being selected on a skills basis encompassing a broad range of skills by a selection committee whose members were recommended by the relevant agricultural industry peak body with an independent chairman appointed by the Commonwealth Minister responsible for the Act. The Commonwealth committed to matching grower levy funds up to a level of 0.5% of the gross value of production (GVP) and provided one nominee to each Board.

- More recently, the Commonwealth, particularly during the term of the previous government, has encouraged the RDCs to restructure themselves as companies free from Commonwealth involvement and with industry levies and Directorships being determined at periodic General Meetings. Commonwealth nominees were removed from all Boards.
- Not all RDCs have restructured to the "company" model, but many have. In consequence, those RDCs have tended to become politicised and this can result in a loss of the comprehensive matrix of skills necessary to run an effective research program and business. In some cases there has been inelegant public brawling in the appointment and decision-making processes.
- The role of R&D investment has become confounded with industry promotion, the benefits of which are not always clear. Research investment in some cases appears to have been given a reduced priority – for example the recent decision by Australian Wool Innovation Ltd to change the split of its investments from 40% research : 60% promotion to 30% research : 70% promotion.
- Whilst increased promotion may lead to short term market gains, it is at the potential risk of losing international competitiveness in the longer term through reduced innovation and adoption in the industry. These trade-offs must be carefully considered.
- Similarly, there are issues with funding research into "value adding". There is a risk that the growers through their levy will fund the work, in good faith, but the main beneficiaries are the manufacturers and consumers.
- Whilst the move to the "company" model has had the benefit of reducing Commonwealth involvement (though the Commonwealth can still be up to a 50% investor), it is the Institute's view that overall, the change has been of doubtful benefit. For example, the Grains R&D Corporation (despite some recent adverse publicity) is widely seen as an effective manager while retaining the "Corporation" model.
- The system of matching industry and Commonwealth investment in agricultural R&D as envisaged in the PIERD Act 1989 has generally ensured that Australia has been able to maintain its international competitiveness in most rural industries. The system needs to be continued but requires some further fine tuning to return its productivity gains back to levels of yesteryear.

REDUCED ELECTORAL SIGNIFICANCE OF THE RURAL SECTOR

- The extent of increase in efficiency through the adoption of new technologies and the consequent rural adjustment that has taken place, with many former producers having now left the industry, has meant that agricultural producers have rather less numerical electoral significance than previously.

ENSURING AUSTRALIA'S COMPETITIVENESS

- Of great importance also is agricultural education. At present we have a situation where there are too few graduates to meet the demand not just in research but across the Board. It has been estimated that there is demand for 2000 agricultural and related graduates per year but we turn out just 700. We believe that the situation will reach crisis point by 2012, if it isn't there already.
- The Institute suggests that great care needs to be taken in the pursuit of public/private good and reduced market failure arguments, which in our experience are frequently used as a means of reducing the contribution by governments. Just because a particular sector benefits, so usually does the associated service sector and the broader community. Furthermore non financial aspects are frequently not taken into account.

- We do not believe that there is a clear understanding of the drivers for private R&D in Australia. It is often assumed that it is entirely about self interest and that in itself stands in the road of what could be beneficial collaboration.

The main point AIAST makes is that whilst the current situation is far from perfect, great care needs to be taken so that changes add value and do not threaten a system (especially that of the RDCs established under the Primary Industries and Energy Research and Development (PIERD) Act 1989) which is basically sound and the envy of many other advanced economies. It has ensured most Australian agricultural industries have been able to successfully maintain their international competitiveness.

APPENDIX 3: A BRIEF SUMMARY OF RELEVANT SECTIONS FROM RECENT STUDIES WHICH RELATE TO AGRICULTURAL RESEARCH, DEVELOPMENT AND EXTENSION.

(Compiled by Dr John Radcliffe for AIAST)

Report 1. International Assessment in Agricultural Science and Technology for Development (FAO/World Bank 2006)

The major point made in the Report is that Global investment in agricultural science, education and training and extension to farmers has decreased at a time when it is most needed. Despite significant progress, there is a gap between the production of agricultural knowledge and its delivery to farmers with poorly developing country farmers being the biggest losers. The report draws attention to the need for a systematic re-direction of agricultural science towards agro-ecological strategies that address production and environmental issues.

Report 2. Prime Minister's Australia 2020 Summit

FUTURE OF THE AUSTRALIAN ECONOMY - Top ideas (p. 11)

1.6 Invest in ideas: commit to long-term national R&D expenditure that is substantially above the OECD average as a fraction of GDP

1.12 Innovation Australia: establish a coherent National Innovation Agenda to drive Federal and State government policies on innovation and creativity

FUTURE DIRECTIONS FOR RURAL INDUSTRIES AND RURAL COMMUNITIES – Challenges (p. 97)

- New research and development, particularly its on-ground extension (that is, learning activities organised for rural professionals from different disciplines to encourage innovation), was deemed critical to effective adaptation to and achievement of the broad array of environmental, productivity and services challenges.

- Participants thought the ability of remote, rural and regional Australia to competitively gain access to, connect with and supply products to other parts of the nation, as well as the world, was constrained by deficits in infrastructure and unnecessary regulatory burdens. The challenge of providing improved infrastructure and new technology in the areas of transport, communication, education and water for remote, rural and regional Australia is considered a crucial priority for improving productivity
  and efficiencies and taking advantage of new opportunities.

- Capacity to deal with change at both a business and individual level needs to be enhanced in rural and regional Australia. All levels of education need attention, especially in the area of sustainable food, fibre and environmental services at a tertiary level. Improved capacity will enable change in other areas such as research and development and economic growth to improve options in rural communities.

Report 3. Creating our Future – Agriculture and Food policy for the next generation ("Corish Report") 2006 - Summary, page 2

Foundations for success

• A stronger emphasis on innovation in production and marketing, underpinned by leading edge research and development, is fundamental to longer term business success.

• Sound macroeconomic and microeconomic policies, supported by substantial ongoing investment in infrastructure, will be vital to a low cost, globally competitive sector.

• A whole of chain, paddock to plate approach is needed to service consumer requirements efficiently and effectively.

• Policies must focus on achieving greater self-reliance of business operators.

• The regulatory burden facing businesses must be reduced.

• *Relevant information must be communicated in a clearer, more timely, accessible and accurate manner.*
• *A partnership approach between businesses and governments will bring the best longer term improvements to the sector's viability and sustainability.*
• *A genuinely cooperative and consistent approach by governments — Australian, state and territory — is essential for policies and programs affecting the sector*

Report 4. Review of the Cooperative Research Centre Program – July 2008 (Mary O'Kane) (Endorsed by the government) – Summary
Page xiii – This review agrees that a greater emphasis be placed on translating research outputs into not just economic but also social and environmental benefits. The latter two objectives could be achieved by reinstating public good benefits as a CRC objective.

Report 5. Public Support for Science and Innovation – Productivity Commission final report, 9 March 2007
Summary
Page xviii –
There are two strong rationales for public funding support of science and innovation. The first is that publicly funded R&D is a significant contributor to innovation in the functions performed by government. Governments need to invest in research to improve the products and services they offer or to better discharge their functions, just as does the private sector. For example, expenditure on research and innovation is pivotal to effective environmental management, the provision of education, defence, and social welfare and health services. It does not follow, of course, that such publicly funded research must be undertaken within the public sector.
The second significant rationale is the existence of 'spillovers' from innovation. These are benefits that cannot be captured by the innovator — ideas that can be used, mimicked or adapted cheaply by firms or others without payment to the originator. Spillovers may arise through the development of basic knowledge capabilities or diffusion of new ideas among firms and others. Such spillovers arise from research undertaken in universities, businesses and public sector research agencies.
Page xxviii –
Subsidy rates for some types of RRDCs should be re-calibrated — with a lead time
The governance design of the Rural R&D Corporation model is inherently sound. Levies that are decided by, and apply to, all beneficiaries of the R&D overcome free-riding and the resultant under-provision of rural research. There are strong grounds for significant public co-funding of those RRDCs where there are spillover benefits beyond industry members and where that research would not proceed in the absence of support (for example, research into improving salinity-damaged areas).
But some industry-focused RRDCs should be less reliant on public co-funding. They receive significant subsidies without a demonstration of commensurate induced spillovers. There are grounds for adjustments of subsidies for these RRDCs, though the precise corrections should be determined through independent review processes on a case-by-case basis. RRDCs should be given a lead time for any changes, so that they can adapt to the new policy.
Page 427
But there is also a real risk of wasteful duplication of research effort across spheres of government (especially in areas such as agricultural research). This does not mean that the States and Territories do not have a part to play in this area. Aside from its use as an input to service provision and policy development, the New South Wales Government noted another dimension to this role:

> *The Commonwealth Government is well placed to determine national research funding priorities, as well as providing overarching support for science and innovation. However, States and Territories, also have a critical role, as this level of*

governance is closer to the science and innovation research centres, the businesses and the special interest communities that benefit from public support. (sub. 91, p. 4).

Accordingly, inter-governmental coordination mechanisms offer scope to improve the efficiency and effectiveness of research effort in those areas where public support at the State and Territory level is justified. In that context, the initiative by the Primary Industries Ministerial Council to develop a national research, development and extension framework for Australia's agriculture, fisheries and forestry industries will be useful, especially given the quantum of research funding, and the fragmented nature of that funding, in this area (DAFF 2005). There may also be a role for similar mechanisms in other fields of research — notably medical and health sciences.

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Evidence presented by the Department of Agriculture, Fisheries and Forestry shows that including some of these additional funding sources increases the potential subsidy rate significantly, depending on how the benefits are distributed. It said:

Total investment in agricultural R&D in 2002-03 was approximately $1.2 billion, having increased by approximately 20 per cent in real terms since 1996-97. States and territories provide the greatest proportion of funds (43 per cent in 2002-03) but this has proportionally declined since 1996-97 (53 per cent). Commonwealth contributions (including higher education) have remained relatively constant (approximately 40 per cent) and business investment has increased in this period (from 8 per cent to 17 per cent).

Table 10.4 **Industry and Australian Government contributions to total RRDC expenditures in 2004-05**

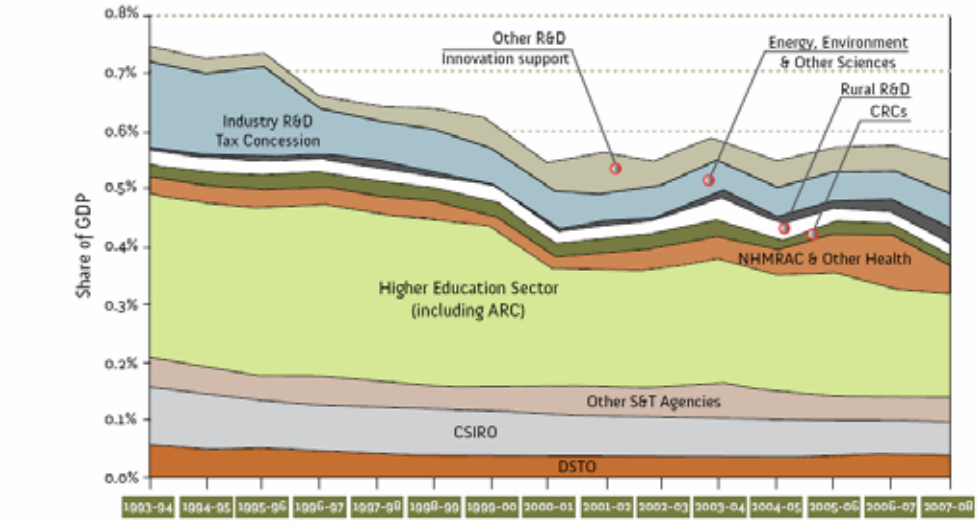
RRDC	*Industry contribution*	*Australian Government contribution*	*R&D[a] expenditure*	*Government contribution per $100 of industry spending*
	$ million	$ million	$ million	Dollars
Statutory RRDCs				
Cotton	4.58	4.32	12.62	94.3
Fisheries	11.20	16.90	29.06	150.1
Forest and Wood Products	3.77	2.97	8.20	78.8
Grains	64.19	35.74	119.53	55.7
Grape and Wine	9.68	8.10	16.89	83.7
Land and Water Australia	-	12.50	26.27	– [b]
Rural Industries	2.68	14.65	21.09	– [b]
Sugar	5.13	4.56	8.66	88.9
Industry owned corporations				
Australian Egg Corporation	0.75	0.76	1.71	101.3
Australian Pork Limited	3.80	4.22	7.67	111.1
Australian Wool Innovation	42.84	13.51	78.49	17.2
Dairy Australia	14.53	14.53	36.11	31.5
Horticulture Australia Limited	31.63	32.91	66.92	104.0
Meat and Livestock Australia	39.04	39.04	78.08	100.0
Total	**233.82**	**204.71**	**511.30**	**76.8[c]**

[a] Includes other sources of income such as royalties, interest, voluntary contributions and co-investments with public sector agencies and other RRDCs. In addition, contributions in one year may not be expended in the same year. [b] These are predominantly public good RRDCs. [c] Excludes the predominantly public good RRDCs.

Sources: Data drawn from sub. 96 and Commission estimates.

Report 6. Venturous Australia – Building Strength in innovation (Cutler and Company 2008
http://www.innovation.gov.au/innovationreview/Documents/NIS_review_Web3.pdf

Figure 1: Australian Government Expenditure on Science and Innovation, 1993–94 to 2007–08, as a proportion of GDP



Summary

National Innovation Priorities

A key task for this Review was to identify a set of National Innovation Priorities to complement the broad National Research Priorities already in effect. To this end, the Panel engaged in widespread consultation with industry groups and other parties around the country. From this it classified areas for attention in terms of:

1. areas under the direct control of the public sector; and
2. areas whereby public innovation could spillover into complementary private sector innovative efforts.

The list of priorities identifies specific areas that would leverage Australia's distinctive geography, economy and capabilities.

In terms of the public sector priorities we identified the following areas: agricultural and food security, climate change mitigation and adaptation, population health, solutions in tropical environments, and applications to utilise broadband infrastructure (especially in health, education and public data access). In terms of stimulating complementary private sector innovation, the following areas deserve attention: resource industries, space and astronomy, finance and risk management, and marine industries. To manage and coordinate these priorities with those for research in public innovation programs, it is recommended that the proposed new National Innovation Council (discussed below) be charged with ongoing evaluation and identification of synergies across programs.

Chapter 6

Universities

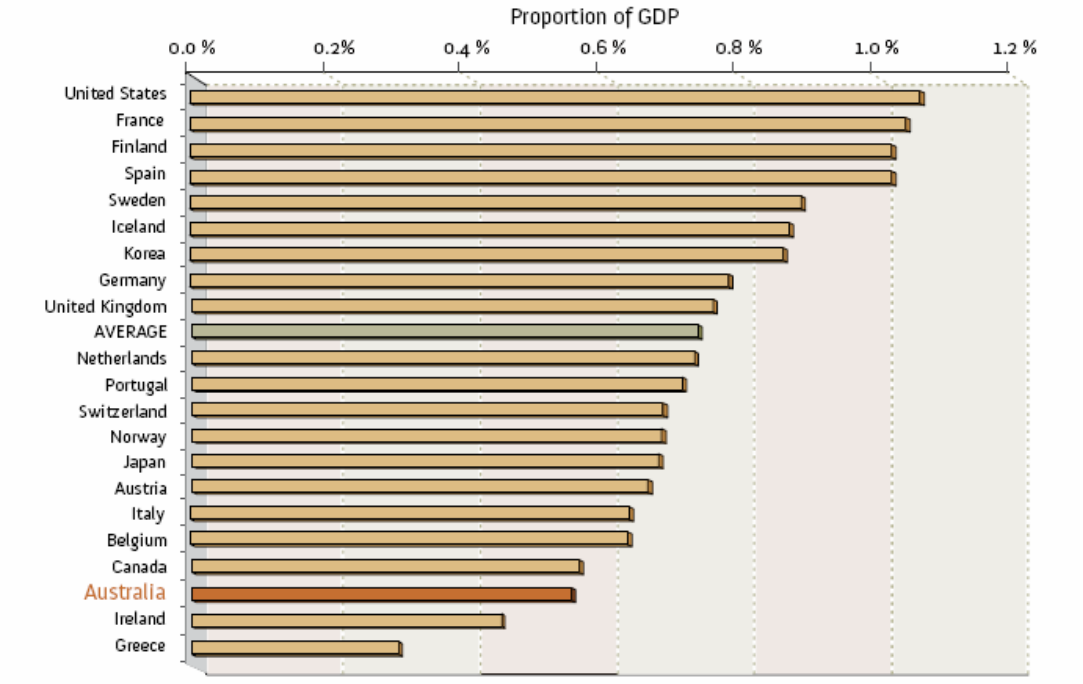
Universities should be producers of research, not investors in research. The present system requires taxing of teaching programs in an attempt to maintain research performance. Universities' roles within the innovation system include knowledge transmission (teaching), knowledge generation (research) and knowledge preservation-diffusion.

Universities assist in the preparation of highly productive, workforce-ready professionals, appropriate to the needs and opportunities of the economy and its component industries and sectors. They also train the next generation of researchers who, whether they choose to work ultimately in the university sector, public research institutions or the private sector, aid the diffusion of new knowledge and build innovative capacity.

Universities are also a major source of research and development activity within the Australian innovation system. They are Australia's engine room for discovery and invention and are the principal creators and disseminators of new knowledge. In fulfilling this function the universities are places dedicated to taking intellectual risks, where scholars can test and develop their ideas with peers from around the world.

In the past two decades the research capacity of the agencies has been substantially reduced. This is evident in the reductions in staff numbers in CSIRO from 7,168 in 1985 to 6,331 in 2007. Within this next year approximately 100 further positions will be lost. Some reductions will be made in lower priority research portfolios but the closures of regional laboratories and the concomitant losses of staff in the agribusiness sector will impose substantial costs on industries of the sector. The Panel regards these particular reductions in Australia's research capacity as regrettable in the context of global food shortages and the potential for CSIRO's research to produce more nutritious food in an environmentally sustainable way and have immense positive effects on the health of millions of people around the world.

Figure 13: OECD government outlays on R&D, 2006



The Review Panel has received a number of submissions proposing areas whereby the government itself can take a leadership role in innovation. The Panel in considering these has identified the following areas whereby there are untapped capabilities within Australia as well as strong demand to complement public policy initiatives. These twin drivers lead us to conclude that these areas should be immediate innovative priorities for the government.

They are:

- *Agricultural and food security*: Food security has become and will continue to be a global

challenge. Australia has the opportunity to: continue to drive agricultural productivity and yields through research; develop globally significant leadership around the development of nutriceutical foods; establish a global brand reputation for food safety and certification; and become an Asia-Pacific-oriented location for significant global facilities for biological testing and certification (Association of Southeast Asian Nations countries already see facilities like the Australian Animal Health Laboratory as regionally significant assets). The Review consultation process revealed a need for greater national strategic leadership in rural innovation. Annex 11 contains suggestions on how to achieve better co-ordination and prioritisation.

- *Climate change mitigation and adaptation*: Australia has a disproportionate global share of environmental challenges. These range across water and land management, salinity and threats to marine ecosystems such as our coral reefs, weather volatility, bushfires, and coastal degradation. Addressing these challenges in the years and decades ahead must remain one of our highest national priorities. As the Garnaut Report on climate change has highlighted, Australia needs to invest more heavily in innovation and technology-based solutions to address many of these challenges, and to build local capability and skills to deploy innovative solutions. There will be significant global markets for Australian-generated solutions. In addition, Australia has distinctive biodiversity assets and biosecurity threats.

Report 7. AIAST Submission to the Cutler Review

The Australian Institute of Agricultural Science and Technology (AIAST), which is the organisation representing professional agriculturalists and agricultural scientists, is strongly supportive of the thrust of the Cutler Review of the National Innovation System. We note the observation that although agriculture is now a small proportion of the GDP, it is among the top sectors in productivity growth, and has well defined R&D systems which will be important into the future in meeting the world food crisis. These systems will be important for Australia's continued national security as well as for its economy.

We make the following comments:-

The great complexity of Agricultural R&D - The agricultural sector has an extremely complex R&D system, probably more so than most other sectors. An earlier version is shown in *Australian Journal of Agricultural Research*, 2005, 56, 1307 (2005). Despite that, it seems to have been effective and is well supported by the rural industries.

Reductions by CSIRO - We note the Review's comments on the reduction in the CSIRO agricultural R&D area. We are especially concerned about reductions in livestock research especially at a time when livestock are potentially the third-highest greenhouse gas sector emitters in Australia and major production system adaptation will be required if livestock are brought within an emissions trading scheme.

The loss of field-based research - The Review does recognise the unfortunate closure of many regional facilities, of which CSIRO Merbein is an excellent example, instituted at a time when the nation faces its greatest agricultural and environmental problems in the Murray Darling Basin. A further example is that of the closure of Mallee Research Station in North West Victoria at a time when adjustment to seasonal variability, especially in lower rainfall areas will be critical to their survival. The Review could more strongly evaluate the significance of agricultural R&D moving away from having a proportion of field based research to depending predominantly on laboratory and office-based (modelling) research. There seems to be a swing towards more basic research in areas such a plant genetics but without the matching plant breeding, applied research, field testing and extension so that

farmers and the community get the benefit. In concentrating on the R, have we lost sight of the importance of the D.

PISC/PIMC consolidation - The report implies favourable comment (Annex 11) on work being done towards greater effectiveness and efficiency and institutional consolidation by the Primary Industries Ministerial Council. Recent developments in that regard are shown, for example, in Primary Industries Standing Committee 14, agenda item 6.6, Annex A, (11 September 2008). However admirable that some aspects of this may be, the Review fails to recognise that the primary driver is that of reducing consolidated revenue-funded R&D by the States/Territories, allowing them to withdraw from many research areas. Cases in point are Victoria, NSW and South Australia, who despite being signatories to the PISC process are slashing budgets and research services before the outcomes of that process are finalised.

Changes to the "R&D Corporation" model - The report does not recognise the changes in many of the R&D investing organisations from the statutory authority model with boards selected on competitive merit by a selection committee (such as GRDC) to the company model where board selection has been accompanied by much divisiveness in the particular agricultural sector Such as AWI, MLA and HAL). This has also involved a concomitant move towards greater investment in promotion at the expense of R&D. It is our impression that those R&D bodies that have continued in the statutory format (*eg* Grains R&D Corporation, Land and Water Australia {LWRRDC} and Rural Industries R&D Corporation) remain more effective than those encouraged into the company model by the previous government. It may be noted that the annual productivity gains by the grains industry eclipse those of most other industries.

Decisions based on perceptions rather than sound science - It is of concern that governments are increasingly responding to voter perceptions generated by those interested in opportunistically gaining attention for emotion and faith-based causes rather than objectively considering the outcomes of well-constructed science. The recent proscriptions on the adoption of genetic modification (GM) technology by some Australian states (still extant in SA, WA and Tasmania), despite the quality of evaluation undertaken by the Commonwealth's Office of the Gene Technology Registrar, and the objective series of papers provided in the AIAST Journal's Genomics Series, are prime examples. The Australian Bureau of Agricultural and Resource Economics has published that under the assumption that imports of GM crops are not restricted in foreign markets, estimated earnings from Australian oilseeds and wheat exports as a result of adopting the outcomes of GM R&D would increase by $918 million (in 2007 Australian dollars) by 2018, compared to what would otherwise be the case. Governments need to devote more investment to the objective appreciation of science by the community.
It is regrettable that R&D funding by governments is largely in response to populist driven fads. Take the swing from production research to natural resource/biodiversity research, which now seems to have given way to a climate change agenda. Such shifts take no account of the integrated nature of these areas from a farm systems perspective, and are costly as short expert resources move from one field to another.

Reduced student entrants to tertiary training in agriculture - The AIAST held a national workshop in 2007 to explore the succession problems potentially faced by the agricultural industries and their service industries by the reduced number of entrants to tertiary training in agriculture. This is a specific case of the more general problem of attracting students to science reflected in the Review. It is of some concern that the community at large has little appreciation of the rate of technologic improvement in agriculture from R&D which have not only led to substantial increases in productivity but also to improvements in the management of the resources. Improvements in irrigation technology are a case in point. A further concern is that a proportion of those teaching agricultural science have themselves had little exposure to changing agricultural systems.

National leadership – The Review and Annex 11 suggest a consensus of the need for greater national strategic leadership. While supporting this, we point out that this has been previously addressed in agriculture in 1993 when a Steering Committee with Commonwealth, States, University, NFF and R&D Corporation representatives oversaw a process of developing of a National Agricultural Research Strategy for Australia. This was followed by a Directions Paper "Innovation in Agriculture" released jointly by Donald McGauchie (President, National Farmers Federation) and the Hon. John Anderson (Chairman of the Agriculture and Resource Management Council of Australia and NZ [ARMCANZ]). This was supposed to encourage adoption of a national approach, but didn't achieve anything nationally. In an earlier approach in 1980, the Coordinating Committee for Rural Research and Extension (CCRRE) was set up by the Federal Minister, chaired by the then Secretary of the then Department of Primary Industry. It met ineffectually for about three years and was scrapped. There may be lessons here regarding the proposal to create a National Innovation Council and a National Research Coordination Council. It seems to the AIAST that there have been enough reviews. We know what is required and caution against more Councils and the like. We need a few champions to clearly expound the cause and governments with the will to recognise the contribution of agriculture to food production, natural resource management, and adjustment to climate change.