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**AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE
AND TECHNOLOGY**

SUBMISSION TO:

**THE INQUIRY INTO THE ROLE OF GOVERNMENT IN ASSISTING FARMERS
ADAPT TO THE IMPACT OF CLIMATE CHANGE**

MARCH 2009

This submission has been prepared by the **Australian Institute of Agricultural Science and Technology (AIAST)** as the peak body representing the professions of agricultural science and natural resource management. One of its major roles is to provide expert, balanced, objective and independent commentary and advice on issues affecting the profession and agriculture generally.

Given the diversity and complex nature of agriculture, the inquiry in question is very complex. Rather than attempt the impossible task of trying to cover the entire field, it is our intention to deal with what we see are some of the major issues and invite the Committee to explore these with us further in due course.

1. The Nature and Impact of Climate Change

There have been numerous reports on the nature of climate change and whether or not it is real or just part of normal patterns of seasonal variation. There are those who attribute recent droughts and even fire events to climate change.

In this respect it is interesting to note recent comments by Dr Peter Hayman, Climate Change Scientist with the SA Research and Development Institute: "One of the key questions is how much weight to put on recent years. One option is to take the last 10 years as the new regime, but given the degree of variability in rainfall, this seems to be placing undue weight on a very short and bad period. If the last 10 years had been wetter than average, most would caution against using them as a guide to the future. The use of a long term record on the other hand gives no weight to the recent period; a simple compromise is to use the most recent 30 years, but also include shorter periods in scenario planning."

In the short to medium term, the reality it does not really matter to agriculture whether it is climate change or seasonal variation – the management responses are similar.

Most accept the reality of climate change but there is still much debate about how, where and with what speed it will impact. We know that carbon dioxide levels will increase and this could be good for plant growth. The impacts on rainfall are far less certain. Rainfall in the agricultural zones of southern Australia is highly variable by world standards and is likely to increase in variability and decline in amount (by 5-10%) over the next twenty years. Temperature will almost certainly rise by almost 1°C over this same time period. Increasing temperatures will improve productivity in southern Australia in areas where current winter temperatures are a major constraint to plant and animal growth. But in much of Australia these changes will make farming more difficult and less

reliable into the future. One of the most serious impacts will be on areas dependent on rain fed storages, especially for livestock.

It is the increasing variability of likely rainfall in the future which will be more challenging for farmers than the actual change in average seasonal rainfall. Increasing variability causes uncertainty and defrays confidence, making it hard for farm managers to remain positive and make the most of good conditions when they do occur.

To a degree since governments, for various reasons, have decided that climate change is real, we must accept that and direct our energies to how we respond. **What we do need to ensure is that government policy responses to climate change do not exacerbate the impact of the change itself on agriculture!**

2. The Capacity of Farmers to Respond

Australian farmers, especially those in the low to medium rainfall zones, are accustomed to dealing with adverse seasons, despite other pressures such as volatile commodity prices and increasing input costs.

It should be pointed out that these adaptations are not just technical per se but have as much to do with business decision making.

An important study on Eyre Peninsula of South Australia funded by the Department of Climate Change (Doudle et al. 2008) looked at how farmers had remained resilient during the recent tough times and found that :

- *They aimed to improve their business but in a measured and conservative way. An important business goal was to achieve high equity and to recover that high equity after major expansions or investments.*
- *They were often not the earliest adopters of new technology. When they did adopt, they did it well and consolidated before moving on to the next thing.*
- *They were keen to learn (often not formally educated), were organised and allocated time to planning, reviewing and leisure.*
- *They recognised they were not experts in every aspect of their business and consulted with others for these skills.*

The project found that further research on potential climate change impacts on farming in these areas should build upon the known strengths of successful businesses by assisting farmers with :

- *An improved ability to identify and analyse potential enterprise costs, benefits and risks.*
- *The flexibility to change the system in response to market and season to develop lower risk, more responsive farming systems – including a range of crop types, enterprise mixes, input types and levels.*
- *The need to maintain networks and relevant information flow to provide short term support, community confidence and balance to sensational climate change headlines.*

Given that the impacts of climate change will be gradual, we are confident that farmers will adapt to the on-farm issues into the future. Just how readily they will be able to do that depends not just on their own capacity but on off-farm influences including the impacts of government policies.

3. Current Adaptations to the Impacts of Climate Change

Farmers are adapting to seasonal variation now and the impacts of climate change will largely be an extension of this. It is important to note that many of these adaptations are consistent with improving profitability and managing risk, and in sustaining the land, water and social resources. Furthermore, the seasons are not the only force for change – input costs and prices require similar adjustments to the management of profitability and risk on the farm.

Whilst it would be difficult to detail all of the adaptations in this short submission, we have listed several below for information (in addition to the above):

- *Lower risk cropping phases (such as more cereals and less broadleaved crops) with the better integration of livestock enterprises.*
- *Better use of available soil water by control of summer weeds (to store summer rainfall), earlier sowing, use of varieties more suited to harsh spring conditions, and retaining stubbles to reduce evaporation from the soil surface.*
- *Timing of expensive inputs such as nitrogen according to crop potential and using precision agriculture to vary inputs according to crop need.*
- *More efficient grazing practices, including feed lots to get better returns from feed grains and protect the land.*
- *Greater use of cut and carry feeding systems in the dairy industry with less reliance on grazing.*
- *Using the land according to its potential, including the use of perennial species on lesser productive land.*
- *In horticulture and intensive agriculture, improved irrigation systems and timing result in better use of scarce water resources.*

4. Future adaptations and the roles of research, development and extension

The following are some of the management options and R&D needs which should be explored in future to assist agriculture to adjust to climate variability and change:

- There is an urgent need to improve the business management skills of farmers – these skills will be crucial in our increasingly deregulated and diverse markets (both buying inputs and selling commodities). The new carbon economy is just one more management skill which farmers will have to learn.
- Growing crops and pastures for carbon sequestering is a science and a business which is very new and requires a lot more objective information for the industry to make the most of the opportunity and to have the most benefit for the environment.
- There is an increasing and urgent need to diversify our current rotations so that farming systems are less reliant on agrichemicals for weed and pest control and can be more responsive to fluctuating climatic conditions (eg make occasional but intense rainfall events into an opportunity not a threat). Strong R&D support will be needed to identify these opportunities and how best to manage them.
- There are still important opportunities for current farming systems to make better use of the limited and sporadic rainfall which does occur in southern Australia. More water use efficient systems will be better placed to cope with climate change and will minimise offsite damage from water escaping their boundaries. Strong R,D&E support is required to develop these opportunities quickly and to get them widely and rapidly adopted.

- Increasing the speed and reliability of seeding will concentrate more of cropping programmes into the most reliable windows for profitable and productive outcomes (for example, disc seeders can be used at speeds 50% faster than tined seeders but still achieve good establishment if used correctly).
- Continued development of crop and pasture types which are more suited to seasonal conditions more common under climate change is necessary, with traits such as increased heat tolerance, shorter growing season types, improved frost tolerance, more suited to multiple uses (eg grain or hay).
- Biological and organic matter cycles are poorly understood in agricultural systems. These need to be much better known before carbon can be managed properly in agricultural systems for the benefit of greenhouse gas abatement and for profitability and sustainability of farming systems. This knowledge is especially thin for mixed farming systems where livestock is an important enterprise.
- Increasing temperatures and reduced rainfall are likely to make conditions more hostile for grain fill of annual crops in late spring. Strategies to seed earlier will be important as will development of more heat tolerant crop and pasture genotypes.
- Maintaining high levels of organic mulch over soil surfaces will be increasingly important (to improve soil condition so that more of sporadic but intense rainfall events can be captured and stored in soil profiles, to keep soils cooler for prolonged microbial activity, to reduce evaporation losses and to allow more efficient extraction of stored water by crops and pastures). Currently mulch levels are restrained by poor productivity in the first place and that most current seeding equipment is not designed for handling high mulch levels in the second place.
- Being able to trade credits from carbon sequestering will (partially) offset increased input costs from introduction of a carbon pollution reduction scheme. But how much can we expect to sequester in different areas with different farm systems?
- Plantations of permanent vegetation for C sequestration and biodiversity may be a useful (but always small component) of farming businesses. They are always likely to be a minor enterprise in the major agricultural zones for cropping. Identification of the most appropriate plant types and management strategies for this minor enterprise will optimise this option.
- Development of renewable energy sources (eg biofuels, solar/wind powered electricity generation) will offset increasing input costs for farmers and also decrease the need for remote transport and delivery infrastructures (eg electricity transmission lines and towers).
- Currently, controlling weeds and pests and improving nutrition with agrichemicals is very cost effective. These products are likely to increase in price into the future (as many are derived from, or are by-products of, the petroleum industry) so alternative techniques need to be developed to replace and complement agrichemicals. Options such as more diverse rotations, higher levels of mulch, very low disturbance seeding technologies and biocontrol agents or chemicals will be increasingly required in the future to maintain or improve productivity with decreased reliance on agrichemicals.
- Management styles which reduce greenhouse emissions from livestock are urgently required (eg improved feed quality, cut and carry vis a vis grazing).
- The impact of climate change in terms of "secondary" effects such as changed weed and pest distributions as well as changed frequency and severity of disease

outbreaks needs to be better understood so that ag industries can develop better risk management strategies for these pressures.

- Improving grain storage, handling and transport to reduce off farm costs. The same opportunities apply to farm inputs.

As an example of current R&D responses, the Department of Primary Industries in Victoria is concentrating on:

- *Modelling the impact of climate change in horticulture*
- *Managing the disruption to water supply in perennial horticulture in a changing climate*
- *Strategies to manage the impact of smoke taint in vineyards, due to the increased incidence of bushfires under climate change*
- *Development of strategies to maintain grape and wine production and quality in a changing environment*
- *Extensive livestock*
 - *Improving the capacity of extensive livestock producers to improve productivity and agilely adapt to variable seasons.*
 - *Development of new grazing systems in southern Australia, incorporating summer active pastures, that increase productivity and profitability and make better use of summer rainfall events.*
 - *Development of low input grazing systems based on native grasses that are potentially more resilient under climate change.*
 - *Modelling farm based scenarios for the lamb industry to better understand the potential impact of climate change.*

5. The Role of Government

There are three important areas for Government:

5.1 Policy

The main policy areas are:

5.1.1 Carbon Pollution Reduction Scheme.

Whilst it has been stated that agriculture will not be included until 2013/2014, we are concerned that many of the policy decisions made before that date will have serious impacts on agriculture.

Agriculture is a diverse and disparate industry which finds it difficult to speak with a single, objective voice. To a degree the industry is unprepared and lacks a factual basis in several areas on which to make coordinated policy input.

The AIAST has embarked on a program of symposia across Australia to inform agriculture and related professionals about the CRPS and carbon economies.

More needs to be done and AIAST is seen as the appropriate peak body to provide objective factually based comment but our organisation simply lacks the resources.

In the circumstances we would ask that Government through your Committee support on going dialogue with a group of agricultural interests which AIAST would offer to chair and act as conduit, so that the implications of proposed policies be adequately explored as part of the political process in an objective, bipartisan matter.

5.1.2 Farm and Rural Adjustment

The response to climate change will undoubtedly result not only in on farm adjustment but also in increasing farm size, with resultant impacts on rural communities.

There are two important issues for government:

5.1.2.1 Government policy should not impede the natural commercial forces for adjustment.

The current Exceptional Circumstances Scheme for example assists those in need, which is a reasonable social objective. But it also retains on farms many who have poor long term prospects and prevents others from increasing their farm size and potentially their efficiency and ability to respond to climate change. In fact the interest rate subsidy component mitigates against adjustment and builds the expectation that the government will step in during difficult times. That in turn builds expectations which run counter to the self help ethic and provides in effect a form of drought proofing which maintains land prices at artificial levels, often beyond the capacity of the land to be profitable. That is not to say that social welfare measures should not apply to farm families or that the current program should be axed immediately. However the current mechanism needs to be replaced with more direct social benefit measures in line with those applying to the rest of the community and do not discourage industry adjustment.

5.1.2.2 Taxation.

Whilst we have not explored specifics, taxation benefits (preferably through rebates) for costs of practices which improve adaptation to climate change would seem a sensible way to encourage these changes to the benefit of farmers and the entire community.

Some examples are:

- *Fencing/water or farm layout which allows better management of land zones*
- *Conversion or purchase of machinery which allows faster, more efficient and earlier crop establishment into stubble retained systems (eg guidance, better trash flow, discs)*
- *Conversion or purchase of machinery which allows variable application of inputs to allow matching to land capability.*
- *Subsidies on machinery for no till operation (such as is being provided by the Lachlan CMA in NSW)*
- *Implementation and management of containment areas for stock*
- *Renewable energy sources (eg biodiesel, wind or solar generated electricity produced on site (so no transmission costs etc)*
- *Feed regimes and management systems which reduce greenhouse gas emissions by livestock*
- *N fertiliser strategies which improve efficiency and reduce likelihood of greenhouse gas emissions*

5.2 Infrastructure

The provision of adequate infrastructure in rural Australia will be critical if it is to adjust adequately to climate change, especially with respect to:

5.2.1 Rural Communication

Attachment 1 is a Submission to the Rural Telecommunications Inquiry.

5.2.2 Commerce, health, education and leisure in rural areas all revolves around transport.

Rail transport is still diminishing at a time when it should still be the most cost effective means of shifting bulk freight. Each State is making its decisions in isolation and AIAST calls for a national policy and commitment.

Air transport seems to be under siege in many country areas and cost of regional services is exorbitant. We are aware that it all revolves around seat occupancy, but again AIAST urges a national strategy.

Road transport is critical, especially with increased levels of freight going via this means. This has an enormous impact on roads, many of which are maintained by local government with the costs met by local ratepayers. Coping with greenhouse costs in country areas is not just about on farm practices but about containing off farm costs. One of the largest of these is freight. Other users can pass on the freight costs, farmers cannot. This potential impact of greenhouse policy must be included in any consideration of the impacts on rural areas.

5.3 Providing Resources

Government has a particular opportunity to play, and an important role, in agriculture through training and research.

5.2.1 Training

Training in agriculture needs to be augmented at all levels

- Graduate/post graduate. The shortage of agricultural graduates is such that it will have a major impact on the capacity of the industry to research and encourage adoption of adaptations to climate change. **Without urgent action in this area many of the policies and measures to encourage change will fail for want of intellectual grunt to support their implementation.**

To quote Jim Pratley ex Dean of Agriculture at Charles Sturt University

- *Employment opportunities in agriculture are substantial and the prospects are bright into the foreseeable future*
- *The level of qualified people employed in the agricultural industry needs to be raised substantially to meet the challenges that lie ahead*
- *The network of university providers in agriculture in both metropolitan and rural areas is more than adequate to meet the needs of the industry*
- *There is cause for concern about the availability of scientists and other professionals to service the needs of agriculture in the short to medium term*
- *At the present time there are in excess of an estimated 2000 jobs annually for new graduates but fewer than 800 new graduates in agricultural science and*

agricultural business in any year. The shortfall is partly met by the appointment of less qualified staff

- *Application and enrolment trends in universities are in decline across Australia, indicating that agriculture is not perceived as a desired career*
- *The image of agriculture, compounded by the ignorance about the industry by the general public, needs to be made positive and exciting*
- *It is the responsibility of all players in the industry to positively promote the industry and careers therein – government, education institutions, farmer organisations, professional societies and agribusiness*
- *Postgraduate scholarships need to be made competitive with mainstream employment and research support funds need to be raised to realistic levels.*

The AIAST and the Aust Council of Agriculture Deans are addressing this issue with the relevant departments but progress is slow – too slow.

Farmers/Advisers. As indicated above there is an urgent need to train farmers and their advisers not just in technical practices but particularly in farm business. IT IS OBVIOUS THAT THE CAPACITY TO ADJUST TO CHANGE, REGARDLESS OF ITS CAUSE, WILL DEPEND ON FARMERS' CAPACITY TO MAKE INFORMED DECISIONS AND MANAGE PROFITABILITY AND RISK. Again there is a dearth of competent training skills in this area.

5.2.2 Research, Development and Extension.

Australia has for many years boxed well above its weight in the area of research and extension. Until a few years ago our agricultural productivity was growing at more than 2% per annum, despite difficult seasons.

That has now changed and our performance has plateaued.

One of the main reasons for that has been the large reduction in research and extension which has meant that we have been living off of our intellectual feedstock.

As budgets have tightened (and preference has been given to the populist areas such as health, education and welfare) expenditure on agricultural research by the Commonwealth, the States and private companies has fallen drastically.

Attachment 2 is a number of excerpts from numerous recent submissions and studies. They all draw the same conclusion – Australia is falling behind in its investment in R&D and science training. That applies particularly to agriculture.

This situation needs to be reversed immediately if we are to provide the technologies and extension services to farmers as an essential part of them adjusting to climate change.

A further reason for the sense of urgency is that agriculture is already behind the eight ball in understanding the impacts of climate change of agriculture and what our responses should be. We have a lot of urgent catching up to do.

Even with \$\$ the recovery will be constrained by the lack of graduates, so the two need to be considered as part of an important capacity building package.

In the circumstances, we would strongly suggest a careful balance between investments to understand the nature of climate change per se and what needs to be done to respond. We note that large investments are being made in the former, which whilst of interest are unlikely to help much with the response program which needs to start now. Rather than wait to understand the nature of the change we suggest an approach of posing a number of "what if" scenarios and then assessing our capacity to adjust to each, and then conducting research and extension to fill the gaps.



National President AIAST

6. References

Exploring adaptive responses in dryland cropping systems to increase robustness to climate change. 2008. S Doudle, et al. SARDI, Minnipa Agricultural Centre. Department of Climate Change Comprehensive Project (# 0711) Report.

WORKFORCE PLANNING IN AGRICULTURE: Agricultural Education and Capacity Building at the Crossroads. JE Pratley, Australian Council of Deans of Agriculture, Charles Sturt University, Locked Bag 588, Wagga Wagga, NSW 2678.

REGIONAL TELECOMMUNICATIONS REVIEW

SUBMISSION FROM

AUSTRALIAN INSTITUTE OF AGRICULTURAL SCIENCE AND TECHNOLOGY

The AIAST is the peak national body representing the profession of agricultural science and has about 1000 members across Australia. All sectors including farmers, consultants, agribusiness, field research people and those in Universities, CSIRO and State agencies are members.

I highlight some issues of particular importance to the profession.

- Communication within the industry is now very highly dependent on email and mobile phones. Adequate capacity and reliability is critical to research, extension and business activities in rural areas. Line speeds in many areas are hopeless and the new era of mobile phone is plagued by large areas with no service.
- It is increasingly difficult to attract professional staff to rural areas which means that we increasingly rely on less experienced staff being supervised from larger centres. This requires the transmission of large files which is not easy on many internet routes. My own experience in a number of areas is that anything over about 2MB becomes a real hassle and on dial up services needs to be sent in the middle of the night if it is to go at all.
- Things like library services are increasingly electronic and without them, professional people and their support staff are even more disadvantaged. My recent attempts to have an interactive/visual project planning session with people on Eyre Peninsula failed because of poor and interrupted line capacity.
- Much of the actual delivery of information to farmers is now by electronic means and is becoming more complex. Take for example the use of decision support software whereby the adviser can communicate in real time with the client, and bring in other information sources live if required. This is easy in the city, but very difficult in many country areas. Another

example is the use of photo capacity using mobile phones where farmers and their advisers can use real images to solve problems. These types of service will be increasingly important as services, including public and private advisers are withdrawn from rural areas.

- The profession of agricultural science faces a crisis whereby there will be a critical shortage of professionals, especially in the field by 2012. AIAST recognises this need and has developed a comprehensive program with Universities, agribusiness, the NFF and Rural Industry Research Corporations to address it at all levels – schools, Universities and Government. Part of this is to improve the image of agriculture as an industry and as a profession – that is hard when we see the effective isolation because of poor communication services.
- We recognise that generation Y whether they come from the country or city areas demand the benefits enjoyed by their peers, including the capacity to communicate. Unless we provide this it will be increasingly difficult to attract young people to (or back to) country areas with the inevitable consequences on demographics and social quality. Whilst we expect this to be one of the prices we pay for rural adjustment and so called development, it should not be exacerbated by a lack of telecommunication services.
- The AIAST is exploring ways in which we can better serve our profession (members and non members) using smart communication technologies. This includes mentoring of undergraduates, new graduates and on going professional development to meet the strict standards required of our accreditation provisions. It is people in the rural areas who need these services and professional support the most, yet who under the current telecommunications we can service least either by virtue of availability or cost.

Geoff Thomas



President SA Division AIAST

Background Notes for AIAST Paper on R&D Conference

The Future for Agricultural R&D in Australia

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 poor developing country farmers being the biggest losers.

John Williams: “In the past, too much of our research, in my judgement, has been focussed on technical fixes to the production arm without giving adequate attention to the natural resource impacts within the whole agricultural ecosystem “(*R&D Review*, May 2008)

Eric Craswell: “We sometimes forget that despite lowered birth rates in many countries, the world population will continue to grow for at least the next few decades and is projected to peak at 9 billion in 2050. There are currently 850 million undernourished people in the world and we have somehow to find ways to feed them better.”

“Looking into the (current global food crisis) topic at more depth reveals a high level of complexity in terms of impacts not only on the production and prices of food and feed commodities and international trade, but also on energy, greenhouse gases, land use and biodiversity: - each commodity or biofuel has its own suite of impacts and ramifications.”

“The IAASSTD report draws attention to the need for a systematic re-direction of agricultural science towards agro-ecological strategies that address production and environmental issues “(*R&D Review*, May 2008)

Report 2. Australia - 2020 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 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

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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.

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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.

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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 percent) and business investment has increased in this period (from 8 per cent to 17 percent).

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

<i>RRDC</i>	<i>Industry contribution</i>	<i>Australian Government contribution</i>	<i>R&D^a expenditure</i>	<i>Government contribution per \$100 of industry spending</i>
	\$ million	\$ million	\$ million	Dollars
<i>Statutory RRDCs</i>				
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
<i>Industry owned corporations</i>				
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

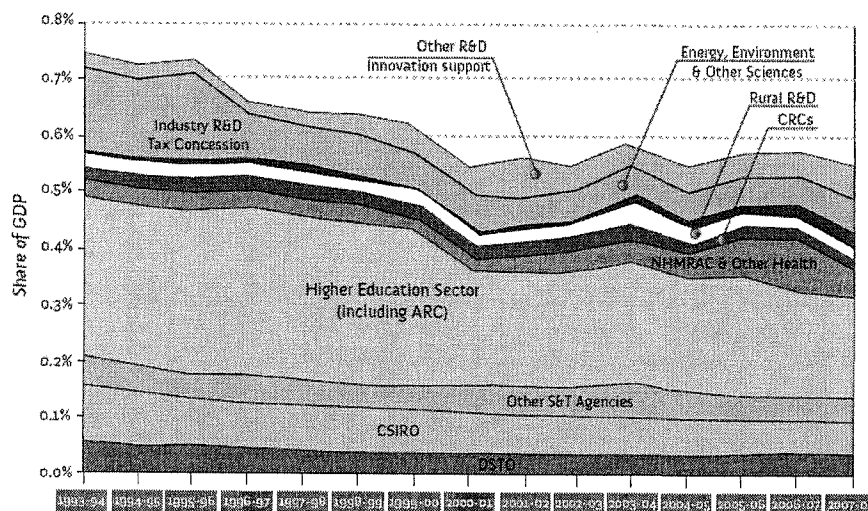
^a Includes other sources of income such as royalties, interest, voluntary contributions and co-investments with public sector agencies and other RRDCs. In addition, contributions in one year may not be expended in the same year. ^b These are predominantly public good RRDCs. ^c Excludes the predominantly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

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 nutraceutical 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).¹ 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

¹ This regional role was reinforced in discussions between the Review Chairman and the Prime Minister of Malaysia in May during the course of the Review.

challenges, and to build local capability and skills to deploy innovative solutions.² 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.

² Garnaut Climate Change Review, Draft Report, June 2008

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.