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Australian Research Council

**SUBMISSION TO THE HOUSE OF REPRESENTATIVES STANDING
COMMITTEE ON PRIMARY INDUSTRIES AND RESOURCES**

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

SUBMISSION DETAILS

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RESEARCH *in the national interest - enabling the future*

INTRODUCTION

This submission

1. On Wednesday 4 February 2009, the Minister for Agriculture, Fisheries and Forestry, The Hon Tony Burke MP, asked the House Standing Committee on Primary Industries and Resources to inquire into and report on *the role of government in assisting Australian farmers to adapt to the impacts of climate change*.
2. The Committee was asked to inquire into:
 - a) current and prospective adaptations to the impacts of climate change on agriculture and the potential impacts on downstream processing;
 - b) the role of government in
 - i. augmenting the shift towards farming practices which promote resilience in the farm sector in the face of climate change, and
 - ii. promoting research, extension and training which assists the farm sector to better adapt to climate change; and
 - c) the role of rural research and development in assisting farmers to adapt to the impacts of climate change.
3. This submission provides brief comments on the role of the Australian Research Council (ARC) in supporting research and research training which may assist the farm sector to better adapt to climate change.

Overview of the Australian Research Council

4. The ARC is a statutory authority within the Australian Government's Innovation, Industry, Science and Research portfolio. Its mission is to deliver policy and programs that advance Australian research and innovation globally and benefit the community.
5. The ARC provides advice to the Government on research matters and manages the National Competitive Grants Program (NCGP). Through the NCGP, the ARC supports the highest quality investigator-initiated fundamental and applied research and research training across all disciplines.
6. The NCGP supports two main streams of research funding – Discovery, under which funding is made available for investigator-initiated research and research fellowships, and Linkage, under which research projects, infrastructure, fellowships, centres and networks are funded jointly with partner organisations in the private sector, government or the community ([Table 1](#)).
7. Funding is allocated on the basis of a competitive peer review process using national and international research experts.

Table 1: Funding schemes under the NCGP

Discovery	Linkage
Discovery Projects	Linkage Projects
Federation Fellowships [now discontinued] (1)	Linkage International [now discontinued] (1)
Discovery Indigenous Researchers Development	Linkage Infrastructure, Equipment and Facilities
Future Fellowships [to commence in 2009]	ARC Centres of Excellence
Australian Laureate Fellowships [to commence in 2009]	Co-funded Centres of Excellence (2)
	ARC Research Networks
	Special Research Initiatives (3)
	Linkage Learned Academies Special Projects

- (1) No new selection rounds will be conducted for these schemes.
- (2) Australian Centre for Plant Functional Genomics, Australian Stem Cell Centre, National ICT Australia and National Groundwater Centre
- (3) Includes funding in 2008 for the Ageing Well, Ageing Productivity and Thinking Systems initiatives (co-funded with NHMRC), the ARC Centre of Excellence for Policing and Security and the Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART)

Discovery schemes

8. The Discovery schemes support research by individuals and teams across a broad range of disciplines to enhance Australia's knowledge base and fundamental research capacity. A strong capability in fundamental research results in the development of new ideas, the creation of jobs, economic growth and an enhanced quality of life in Australia.
9. The objectives of Discovery are to:
- support excellent fundamental research by individuals and teams
 - enhance the scale and focus of research in the National Research Priorities
 - assist researchers to undertake their research in conditions most conducive to achieving best results
 - expand Australia's knowledge base and research capability
 - foster the international competitiveness of Australian research
 - encourage research training in high-quality research environments
 - enhance international collaboration in research.
10. The main Discovery schemes are: *Discovery Projects*, *Future Fellowships*, *Australian Laureate Fellowships* and *Discovery Indigenous Researchers Development*.

Linkage schemes

11. The Linkage schemes aim to encourage and extend cooperative approaches to research and improve the use of research outcomes by strengthening links within Australia's innovation system and with innovation systems internationally. Linkage promotes national and international research

partnerships between researchers and business, industry, community organisations and other publicly funded research agencies.

12. By supporting the development of partnerships, the ARC encourages the transfer of skills, knowledge and ideas as a basis for securing commercial and other benefits of research.
13. The main Linkage schemes are: *Linkage Projects*; *Linkage Infrastructure, Equipment and Facilities*; *ARC Research Centres*; and *Special Research Initiatives*.

ARC SUPPORT FOR CLIMATE CHANGE RESEARCH OF RELEVANCE TO THE FARM SECTOR

Role of the ARC

14. The majority of funding under the NCGP is allocated on the basis of investigator-initiated proposals under schemes that support research across the breadth of disciplines. The policy of supporting excellence encourages the development of a broad range of capability within Australia. It enables a focus, when required, on areas of identified national priority or the development of areas of particular strength. It also helps ensure that, when new needs or opportunities are identified, a core or knowledge will be accessible.
15. Under the *Special Research Initiatives* scheme the ARC is able to take a proactive approach, in consultation with research organisations, professional associations and peak higher education bodies, to identifying new or emerging areas of research. The selection process for the recently established Co-funded Centre for Groundwater Research and Research Training, for example, was conducted through this scheme.
16. The ARC also supports a number of structural priority areas under the NCGP, one of which is research that will directly benefit regional and rural Australian communities. Subject to a sufficient number of quality proposals falling into this category, the ARC allocates at least 20 per cent of available *Linkage Projects* funding to support collaborative research of this nature (as identified by the researchers involved). For funding commencing in 2008, 162 proposals that indicated that their projects fell within this category were awarded a total of \$47.6 million (38 per cent of total funding allocated under *Linkage Projects* for that year).
17. It is important to note that the support provided by the ARC for research in the agricultural area complements support provided by other Australian Government organisations, including the Department of Agriculture, Fisheries and Forestry; the Department of Climate Change; Land and Water Australia; and the Rural Research and Development Corporations.

Examples of ARC-funded climate change research in the farm sector

18. The uncertainty inherent in ecosystems and natural processes makes the effective management of resources in a changing climate a difficult process. There is a role for all research disciplines in contributing to our understanding of the effect of climate change. Below are a number of examples of research the ARC is funding in this area that is relevant to the farm sector.
19. The Australian Centre for Plant Functional Genomics (ACPFPG) is jointly funded by the ARC, the Grains Research and Development Corporation, the South Australian Government, The University of Adelaide, The University of Melbourne, the Victorian Department of Primary Industries, and The University of Queensland. Researchers are using functional genomics to improve the resistance of wheat and barley to hostile environmental conditions such as drought, salinity, frost and mineral deficiencies or toxicities.
20. As stated on the ACPFG website (www.acpfg.com.au), 'by implementing this new technology the ACPFG aims to provide innovative and environmentally attractive solutions to the problems faced by cereal growers by developing varieties that allow more sustainable farming while generating economic, social and environmental benefits. This will also ensure Australia maintains its competitiveness in cereal cropping industries globally.' The ACPFG's current research includes improving drought and salt tolerance of cereal crops; improving boron tolerance in barley and investigating nitrogen use efficiency in cereal crops. This research will improve crops resistance to the impacts of climate change and thus improve crop yields.
21. The Centre for Groundwater Research and Research Training is co-funded by the ARC and the National Water Commission, and was announced on 22 January 2009 by Senator The Hon Penny Wong, Minister for Climate Change and Water.
22. The Centre will support novel, innovative and cross-disciplinary research and training in the field of groundwater, and will provide scale and focus to Australia's groundwater research, building research capacity and provide outcomes of significant national benefit. It will undertake research in all aspects of groundwater and will lead the training of a new generation of hydrogeologists, groundwater engineers and groundwater managers, thus contributing to greater understanding of Australia's groundwater systems and inform decision-making required to ensure the sustainability of groundwater systems.
23. Climate change is predicted to lead to periods of increased drought and changing rainfall patterns in crop growing areas. In 2008 funding was awarded under the *Linkage Projects* scheme for work that will determine the effect of drought and rainfall patterns on the efficiency of fertiliser use by crops. The project, involving researchers from The University of Adelaide and CSIRO – Land and Water, aims to provide growers with nutrient management advice when drought conditions occur, or when climate change causes changes in the normal patterns of soil moisture status.

24. A team from The University of Western Australia is also looking at the efficiency of crops in acquiring water and nutrients from drying environments. The team, which includes researchers from the Western Australian Department of Agriculture and from Pennsylvania State University in the United States of America, was awarded funding under the *Discovery Projects* scheme. They will use a simulation model to develop a computer-aided design of 3-D root structure and function (water and nutrient uptake) tailored to particular environments. The model will be tested in a breeding program for identifying narrow-leaf lupin genotypes with superior root properties. The blueprint developed as part of this work will be adaptable to other crops. Improvements in water-use efficiency of crops will result in greater yields and a reduction in environmental problems associated with unused water and nutrients, particularly salinity and eutrophication.
25. Work is also being done on the relationship between the economy and the impacts of climate change in the Murray-Darling Basin. Professor John Quiggin and the research team at The University of Queensland's Risk and Sustainable Management Group (RSMG) understand the issues that will face the Murray-Darling Basin. The RSMG addresses fundamental issues of environmental sustainability through policy development and advice, modelling projects and simulations.
26. RSMG's research findings have been used by a variety of bodies, including the Murray-Darling Basin Commission, the Australian Bureau of Agricultural and Resources Economics, and by state and Commonwealth governments in the formulation of water policy. The RSMG has played a major role in the discussion of water policy and climate change.
27. In an article in a publication highlighting ARC-funded research, Professor Quiggin noted "An important research finding has been that an increase in the frequency of drought is likely to lead to larger losses in the value of agricultural output, rather than a uniform reduction in rainfall. This finding implies the need for more flexible agricultural and irrigation systems, and a reconsideration of storage and water allocation policies."¹
28. Research further afield has found that rainfall over Western Australia is controlled by sea surface temperatures in the Indian Ocean. Professor Matthew England, co-Director of The University of New South Wales Climate Change Research Centre, found that Indian Ocean temperatures seesaw between dry and wet years. The seesaw pattern involves two massive patches of cold and warm water sitting next to each other off the Western Australian coast. During dry years, the ocean forces a southward shift of the so-called 'Roaring Forties' winds. These winds bring rain-bearing fronts onto the southern edge of the Australian continent. As the winds drift south, so too does the rainfall normally destined for Western Australia, leaving the region dry. Rainy years see the same process in reverse: the ocean temperature pattern seesaws, the Roaring Forties and the rain-bearing fronts move closer to the continent, resulting in rainfall in Western Australia.

¹ Australian Research Council, 2008, *Outcomes – results of research in the real world*, p. 43-44

29. This discovery has helped improve predictions of Western Australia's large rainfall variations, which is good news for the region's farming sector, water management and bushfire control. The Western Australian Department of Agriculture and Food has been using Professor England's temperature pattern to forecast seasonal rain for farmers over the past three years.²

² Australian Research Council, 2008, *Outcomes – results of research in the real world*, p. 84-85