Australian Academy of Science
Ian Potter House, Gordon Street, Canberra ACT 2601

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Secretary:

Committee Secretary
Standing Committee on Primary Industries and Resources
PO Box 6021
House of Representatives
Parliament House
CANBERRA ACT 2600
AUSTRALIA

Dear Secretary

The Australian Academy of Science (AAS) is pleased to provide the Standing Committee on Primary Industries and Resources (Committee), with a submission to the ***Inquiry into the role of government in assisting Australian farmers to adapt to the impacts of climate change.***

Summary
Australia has and will continue to have a variable climate. Australian farmers are adaptable but will be more successful in the future if opportunities for scientific advances are made available. This will require the reversal of the present trend of declining numbers of students taking agricultural and allied courses, including a decline in PhD enrolments in such areas as plant sciences. The Academy of Science notes the need for research on direct effects of increasing carbon dioxide concentrations, for analysis of the optimum relationship between the private and public sectors in developing improved germplasm, and calls for a Commonwealth role in agricultural extension.

1. The AAS draws the attention of the Committee to the Report by the AAS on *Priorities for Australian Climate Change Science Research*, released on 28 November 2008, and appended to this submission. The Report endorses the findings of the Fourth Assessment Report of the IPCC and strongly supports the call for increased national investment in the science of climate change.

2. Much of Australian agriculture depends on rainfall amount and timing. The Report makes clear that while total global rainfall is likely to increase, the regional trends are much more uncertain. It notes that the scenarios of the IPCC are not sufficiently reliable for adaptation planning in Australia. Depending on the criteria adopted for assessing skill at predicting present-day climate, the weighted projections of ensembles of model projections can be one of drying a particular region, or of wetting. Continued support for basic research on climate change is needed, including observations, experiments theory and modelling.

3. The Australian farmer already deals with an uncertain climate. For example, the high temperatures and below-average growing season rainfall experienced by most cropping regions of Australia over the past 5 years exceeded model predictions of trends for future climates. Such extreme variability in temperature and rainfall is likely to continue. Management practices that enabled farmers to deal with past uncertainties of climate are likely to continue to be of value. Nevertheless there are likely to be great opportunities in plant and animal breeding and in improved agronomy and animal husbandry for increased resilience, and for increased profitability when averaged over periods of several years. Australian agricultural experience in climate variability is likely to be a valuable resource for the world if such experience (trained agricultural and related scientists) can be sustained. The numbers of students entering programs in agriculture, plant science and related disciplines has reduced drastically over recent years, and that includes the PhD level students. Please see the attached papers prepared for the Deans of Agriculture at Australian Universities. We note that State Governments supported agricultural extension much more in the past than is now the case, and in many cases farmers now rely on private consultants. We recommend consideration of an increased role and support of research by the Commonwealth for scientists to interact and link with farmers and the network of grower groups across Australia.

4. One certainty is that concentrations of atmospheric carbon dioxide will continue to rise for some time. This will have direct effects on plant (and crop) growth and yield, because carbon dioxide [CO_2] is the substrate for photosynthesis. Increased concentrations of carbon dioxide also increase the ratio of growth to water use by plants, making the response of crops to increased [CO_2] proportionally greater in drier regions/years than in wet ones . However there is large genetic variation in these responses, including variation among genotypes of wheat, and so research that aims to identify the underlying causes, needs to be supported. There is a need to incorporate the genetic material appropriately into Australian germplasm. Increased CO_2 concentrations can also reduce the protein content of seeds and leaves and this will have implications for grain quality attributes (eg baking quality of wheat). Susceptibility to existing or new crop diseases and pests, and subsequent nutrient cycling in soils are all new areas worthy of research focus. The Committee should assess whether current means of delivering improved germplasm (new varieties), is well suited to Australia's needs, noting that most of the final delivery is from the private sector. The Academy of Science recommends that partnerships between research institutions and relevant companies be fostered.

5. There is a potential threat of increased temperatures adversely affecting fertilization and seed set (in rice for example) and appropriately adapted varieties will need to be developed. Increased temperatures lead to increased rates of crop development, so that crop duration and timing will have to be adjusted. Again the question arises about how much research should be done in the public domain, and how much should remain with private companies, and how much could be accelerated by promoting useful partnerships.

Graham Farquhar
Acting President AAS

20 March 2009

Appendices: 1. AAS Report on Climate Change
2. JE Pratley Workforce Planning in Agriculture: Agriculture Education and Capacity Building at the Crossroads
3. JE Pratley & L Copeland Graduate Completions I Agriculture and Related Degrees from Australian Universities, 2001-2006