

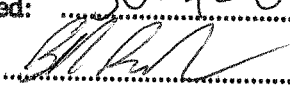
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MOC09/389

The Hon Dick Adams MP
Committee Chair
Standing Committee on Primary
Industries and Resources
PO Box 6021
Parliament House
Canberra ACT 2600

Submission No: 68
Date Received: 30-4-09
Secretary: 

Dear Mr Adams,

**Submission to "Inquiry into the role of government in
assisting farmers to adapt to the impacts of climate change"**

Thank you for your invitation of 5 February 2009 to make a submission to the Standing Committee on Primary Industries and Resources "*Inquiry into the role of government in assisting farmers to adapt to the impacts of climate change*".

I attach the New South Wales Department of Primary Industries' submission.

Although information in the submission is predominantly based on NSW experience, it recognises that climate change adaptation solutions require the highest possible degree of national cooperation.

Nonetheless, the submission also summarises relevant activities NSW DPI is implementing to prepare the NSW agricultural sector for the projected effects of climate change. These activities include current research findings, policies, strategies and projects designed for future funding.

If you have any further questions regarding the submission, then please contact Ms Wendy Stamp, Executive Director, Strategy Policy and Communications, NSW Department of Primary Industries

Yours sincerely



IAN MACDONALD MLC

SUBMISSION BY THE NEW SOUTH WALES DEPARTMENT OF PRIMARY INDUSTRIES

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**

New South Wales has an estimated 43 000 farms covering up to 62 million hectares of agricultural land, which is 77.5% of the area of the State. The gross value of NSW agriculture was \$8.75 billion in 2006–2007, with about \$5.4 billion in exports.

Given the significance of the sector, the agricultural sector's adaptation to climate change is critical for NSW—and for farmers across Australia.

The NSW Government already has a substantial record of commitment to dealing with the impacts of climate change, at both a State and national level.

A national approach to climate change adaptation is vital for future success and, for this reason, the recommendations in this submission focus on suggestions for nationally-supported and nationally-coordinated actions. Many of the recommendations can be carried forward through existing frameworks and forums such as COAG, the Primary Industries Ministerial Council and those listed below, although some may require new approaches.

Key climate change strategies and plans already in place include: the *National Agriculture and Climate Change Action Plan*, the *National Biodiversity and Climate Change Action Plan*, the National Climate Change Adaptation Framework, National Climate Change Research Strategy, and in NSW specifically the *NSW Greenhouse Plan*. The NSW Government is developing a Climate Change Action Plan (to replace the NSW Greenhouse Plan), which will outline actions over the next five years to reduce greenhouse gas emissions, support adaptation across a range of sectors and encourage prosperity in a low-carbon economy. The Plan will set out the strategic priorities for NSW Government action across the State, including in relation to agriculture.

At a National level, the NSW Government is an active participant and contributor to the following key groups that deal with the effects of climate change on primary industries:

- National Climate Change Research Strategy for Primary Industries¹.
- High Level Officers Group².
- COAG Working Group on Climate Change and Water³.
- National Climate Change Adaptation Framework⁴.

While the Commonwealth Government has ownership of climate change issues relating to Australia's commitment to the Kyoto protocol, it also has a significant leadership, coordination and funding role for inter-jurisdictional activities relating to broader climate change issues. This is particularly relevant to assisting the farming community adapt to climate change; due mainly to the difficulty in separating adaptation and mitigation activities at the farm level.

However, States and Territories have significant proven expertise, capacity and access to the farming community. This skill base should not be overlooked in the Commonwealth Government's formulation of adaptation or mitigation policies.

¹ Joint initiative of the Rural Research and Development Corporations, federal, state and territory governments, and the CSIRO, managed by Land & Water Australia.

² Established by the Primary Industries Ministerial Forum on 19 September 2008, to ensure a coordinated national response to facilitate mitigation and adaptation in primary industry sectors including agriculture.

³ Established in December 2007 to provide a mechanism to progress cross-jurisdictional coordination on climate change action.

⁴ Endorsed by the Council of Australian Governments (COAG) in April 2007. This Framework includes actions across all jurisdictions to assist sectors, such as agriculture, which are vulnerable to climate change.

1. INQUIRY TERM OF REFERENCE

Current and prospective adaptations to the impacts of climate change on agriculture and the potential impacts on downstream processing

The possibilities for adapting to climate change depend heavily on understanding what the changes, and the potential impacts of those changes, are likely to be on livestock, crops, and agricultural practices.

The NSW Government has made significant investment in establishing the potential impacts of projected climate change on the agricultural sector. Work by the NSW Department of Primary Industries (DPI), other NSW and interstate agencies, and various research bodies include:

- Climate Change projection modelling with Bureau of Meteorology.
- Biological/ecological responses to climate change (both modelled and empirical).
- Development of distributed information and data systems.
- Risk assessment, prioritisation models.
- Spatial and temporal monitoring.
- Development of emergency management strategies.
- Communication, raising awareness strategies.
- Policy development.

However, it should be noted that most of this work is developmental and preliminary. Initial findings will assist in the development of more comprehensive analysis, and shape further research programs.

There is a shift towards farming practices that improve the adaptive capacity of the agriculture sector. There are a number of current best management practices that can be implemented now. Examples of these best management responses include the increased adoption of practices that retain groundcover and increase soil carbon, increased adoption of no-till technology and precision agriculture practices, better use of climate and weather information in determining critical seasonal risk management decisions, increased adoption of water use efficiency technology and practices, and better use of decision support tools and systems.

Government also has a role, in partnership with industry, to the development of new risk management tools, to address highly complex and interrelated agricultural activities, to increase flexibility and resilience, understand the natural capacity of systems to adapt to the expected rate of change and test the productivity range of crops and livestock amongst other issues.

The current research initiatives of NSW Department of Primary Industries can be found at the website:

www.dpi.nsw.gov.au/research/topics/climate-change

The NSW Department of Environment and Climate Change (DECC) and the NSW Department of Water and Energy (DWE) are currently undertaking assessments of the likely impacts of climatic changes on biodiversity, soils, stream flow and run-off, the coastal zone and flooding risk in each of the NSW State Plan regions. Preliminary information on these changes can be found on DECC's website at:

<http://www.environment.nsw.gov.au/climateChange/regionsummary.htm>

Climate change modelling

All natural systems have evolved to their current state as a result of the climate in which they developed. Similarly, primary production systems (such as agriculture, forestry, and fishing) have developed to suit the climate experienced at their locations over the last 100 years or so. The

capacity of different systems to adapt to changes in climate beyond previous experience is largely unknown, which adds to the uncertainty about likely climate change impacts.

Given this uncertainty about forecasting changes, there is a need to "ground truth" or "validate" our understating of the impacts of climate change with up-to-date observations from a well-structured modelling and monitoring framework. Forecast projections can be compared with evidence from monitoring to provide a solid scientific foundation for understanding the impacts of climate change on primary industries and the broader ecological systems in which they occur.

Government plays a vital role in addressing these gaps, in particular NSW DPI, has devised a project called the Climate Change Adaptation Strategy Assessment Tool (CCASAT). Additional funding for this tool would assist in determining the resilience of current farming practices and the coping range of current practices, and would be a strong step towards choosing suitable adaptation strategies⁵.

Recommendation 1

That the focus of the next funding round of the Commonwealth Government's program, *Australia's Farming Future*, be on climate change modelling and impact assessment (including at regional and local scales).

(a) Programs such as NSW's DPI Climate Change Adaptation Strategy Assessment Tool (CCASAT) would be appropriate for funding under *Australia's Farming Future*. When completed it will provide a comprehensive and highly versatile modelling tool for assessing the resilience and coping range of agricultural systems.

Adaptation and mitigation

It must be noted that, within agriculture, changes to farming practices may meet both mitigation and adaptation objectives at the same time (to varying degrees). For example, "no-till" cropping is an adaptation because it reduces water consumption, but at the same time delivers effective mitigation because it retains more carbon in the soil than traditional plough-and-crop. Altered tillage can reduce emissions, reduce soil loss, improve soils by incorporating organic carbon, and sustain crop yields in a hotter, drier climate.

Another reason for linking the consideration of mitigation and adaptation is that agriculture will need to receive some credit for its mitigation methods to offset the increased cost of raw materials and transport for farmers that will occur as soon as the Carbon Pollution Reduction Scheme starts.

Evidence suggests that the introduction of an emissions trading scheme is likely to have a significant impact on agriculture in the short- to medium-term. The Australian Farm Institute (AFI) commissioned the Centre for International Economics⁶ (CIE) to model the impacts on Australian agriculture of an emissions trading scheme incorporating the Australian Government's emissions reduction target of a 60 percent cut from 2000 levels by 2050. The results are compared to a baseline business as usual scenario (BAU) under which no ETS is introduced. The findings were that by 2030 emission permit costs are predicted to account for 25% of farm-gate price for wool, 22% for beef, 16.5% for sheep meat, 10% for dairy, 5.5% for pork and under 5% for poultry, grain crops and cotton.

⁵ The CCASAT would use data from Global Circulation Models (GCMs) and apply them to assess specific responses required by each of the major agriculture sectors, including broad-acre cropping, grazing, and intensive industries (such as horticulture) to adapt to, and capitalise on, the opportunities that may be presented by climate change and increased climate variability. Models addressing pest and disease issues relevant to those industries can also be informed by CCASAT. Within a current NSW DPI project, the basic GIS framework was developed and wheat was used as the case-study to demonstrate the use of the tool. The CCASAT project would alert the agriculture community to the potential impacts of climate change and encourage agricultural industries to develop appropriate adaptation strategies.

⁶ Some Impacts on Agriculture of an Australian Emissions Trading Scheme. The CIE. February 2009. Publisher: Australian Farm Institute. ISBN:978-0-9805475-8-0

Many options for mitigating greenhouse gas emissions have complex interactions and unintended consequences for total emissions. For example, an increase in fertiliser application to increase crop or feed biomass may increase the soil carbon, but at the same time could also increase emissions of nitrous oxide (N₂O) and methane (CH₄) released from the soil. One molecule of methane has 25 times the global warming effect of one molecule of carbon dioxide (CO₂), while one molecule of nitrous oxide has 298 times the effect. On top of this, if livestock numbers increase to take advantage of the increased feed biomass, the net result could be an even worse greenhouse gas outcome.

Options proposed to mitigate emissions can also have unintended adverse environmental or socio-economic impacts. For example, use of agricultural crops for biofuel has led to inappropriate clearing of native vegetation (e.g. tropical rainforests for palm oil plantations in Asia) and has led to food shortages in third world countries. To prevent such perverse outcomes, a broader sustainability assessment methodology needs to be developed and applied to mitigation proposals.

Life cycle assessment is a well-developed tool that allows the direct and indirect environmental impacts, on- and off-site, from agricultural land use to be quantified in a systematic manner. NSW DPI has sought Commonwealth Government funding for a project that will undertake life cycle analyses for key Australian extensive farming systems, with focus on greenhouse gas emissions and removals, to identify the major sources of emissions, and opportunities to reduce emissions. Such life cycle analyses need to be considered when developing adaptation strategies so that the best management practices may be identified or developed and improving understanding of externalities.

Recommendation 2

Better recognise the links between mitigation and adaptation policies—in particular, that increased agricultural costs associated with the CPRS will induce some structural adjustment.

- (a) The Australian Government with the assistance of States through the High Level Officers Group of PIMC should explicitly consider the costs of proposed mitigation policies on agriculture, particularly when developing and applying structural adjustment programs (regardless of whether agriculture itself joins the Carbon Pollution Reduction Scheme).
- (b) If agriculture is to be included in the national mitigation scheme (the CPRS) in 2015, additional and more suitable measures (i.e. "complementary measures") should be devised and applied. Again, the High Level Officers Group of PIMC should be tasked with coordinating this action.

Recommendation 3

Develop "life cycle analyses" for agricultural and other primary produce.

That the Commonwealth Government develop "life cycle analyses" for agricultural products and produce from other primary industries (i.e. measure the contribution to the emission or sequestration of greenhouse gases, over the full lifespan of produce).

Biosecurity threat

Australian animal and plant production systems are vulnerable to an array of invasive species that include pest animals, weeds, and diseases. Under typical climate change scenarios, existing invasives will continue to spread further south, and northern species will become increasingly important in key southern production areas. Aspects of climate change, including increases in temperature, increases in atmospheric carbon dioxide concentrations, and nitrogen depositions may favour some species at the expense of others—either species currently present, or new exotic species that are physiologically better adapted to exploit such conditions. With increasing global

trade accompanying the projected climate change, fresh introductions of exotic species into Australia are also likely.

Because of the strong likelihood that pest plants, pest animals, and diseases will spread further south than their current ranges, interstate experience will be invaluable (e.g. Queensland experience for NSW, and NSW for Victoria). With much of the research and pest management currently being carried out in State government facilities, strong interstate cooperation and exchange of information will be crucial.

To counter the risk of fresh introductions of damaging exotic species, increasing investment in national biosecurity is more important than ever, and strong links with other national pest management agencies would also be an advantage.

Recommendation 4

Biosecurity

That the current ongoing interjurisdictional work on the development of AusBIOSEC, to establish a national policy framework for collaboration on biosecurity issues affecting primary production, should include:

- (a) Estimates of the biosecurity risks associated with climate change;
- (b) development of projections to plan for the changes that will be required in managing increased risk to pest and disease and in emergency management;
- (c) Consideration of the likely behaviour of both existing and potential introductions of new exotic pests and diseases; and
- (d) consideration of likely shifts in extreme weather-related events (e.g. fire, flood, drought, extreme heat/cold).

2. INQUIRY TERM OF REFERENCE

• The role of government in: augmenting the shift towards farming practices which promote resilience in the farm sector in the face of climate change

Governments have a fundamental role in promoting resilience in the farming sector because:

- Individual farmers do not have the resources to collect and analyse the massive volume and complexity of information needed to design and build the most resilient farming systems.
- The private sector's incentive to carry out this work is limited, given the timescale over which the necessary information must be collected, the uncertainty of results, and the low opportunity for commercial return on research investment.
- Keeping Australia's agricultural (food production) sector viable over the long-term is in the national interest.

The role of governments in this regard can include giving farmers clear information about the projected changes and possible impacts on their current practices, the tools to make decisions about their future farming practices, providing extension and educational training about how to make these changes, and giving access to new opportunities that may arise as a result of climatic changes.

The NSW Department of Primary Industries has already taken many actions to assist farmers change their farming practices to build long-term resilience, including:

Predictive models and risk assessment tools

- DPI was funded under the NSW Climate Change Action Grants (now part of the NSW Climate Change Fund) to conduct a project to build a Geographical Information System (GIS)-based framework for assessing the risk of climate change for agricultural production systems. This framework will provide a tool to assess the impact, vulnerability and potential adaptation options of the range of agricultural systems in NSW.
- In 2007, DPI completed a *Climate science for better NRM in western NSW* project which developed refinements to a spatial growth model for vegetation types in western NSW. This will allow more reliable monitoring and forecasting of ground cover at regional scales, and provide the ability to warn of possible land degradation events.
- DPI has also developed a life cycle assessment tool which allows the direct and indirect environmental impacts, on- and off-site, from agricultural land use to be quantified in a systematic manner. This work will assist decisions about how to include agriculture within an emissions trading scheme.

Education about climate change impacts in the agricultural sector

- DPI established a climate risk management team to assist farmers to improve their short term decision-making in response to seasonal climate variability (El Nino Southern Oscillation Index). The team also undertakes a broader extension and education role for farmers, on climate change and climate variability.
- DPI developed a training workshop, *The Farmers Guide to Managing Climate Risk*, that can provide farmers with essential knowledge and tools to incorporate climate risk management into future planning for their enterprises.
- DPI has also conducted workshops across the state on understanding soil carbon (with significant farmer demand), and farm water supply under climate change with funding National Action Plan funding.

Decision-making tools

Successful adaptation requires the ability to understand what is changing, and how to respond to those changes. Farming in a changing climate requires good decision-making skills, and the appropriate tools. Decision support tools will be critical to give producers the skills and capacity to make timely and well-informed decisions. There are currently a number of such tools available for some, but not all, sectors. Even with existing tools, the relevance and suitability for addressing climate change has not been evaluated, and modifications may be required to deal with it.

NSW DPI has documented the use of the StockPlan decision support tool in the field. StockPlan is a drought decision support tool that assists producers to work through a number of livestock management options when in a drought, and helps decide whether to feed, agist or sell. This decision support tool is available as a stand-alone product, and is also offered as part of a specialised training program. Producers who received and used the tool in combination with the training program are more likely to have made a decision compared with those who did not have that experience. With the training, producers will have the confidence and skill to use the decision support tool in the future, if similar situations arise.

Recommendation 5

That the Commonwealth Government consider establishing a new national advisory committee with State and Territories, in partnership with industry, to coordinate the development of extension services and "decision support" tools, and arrange for the training of farmers in the use of the tools. The group could oversee:

- (a) Evaluation of existing decision support tools for their relevance in a changing climate.
- (b) For situations where there are not suitable decision support tools, development of these tools in consultation with researchers, extension specialists and industry specialists.

- (c) That primary producers receive training in the use of these tools in their own regional locations.
- (d) Provision of extension services in regional areas to help farmers interpret and apply information to assist them manage risk within their business, enable them to adopt current best management practices, and enable them to be more responsive to a changing climate.

This Committee should link to the work of the Primary Industries Ministerial Council.

Socio-economic considerations

Economic analyses of farming and related industries needs to be undertaken to evaluate and assess the viable size of enterprises that will have the capacity to manage risk effectively in a changing climate.

Another significant challenge faced by governments addressing the impacts of climate change on the agriculture sector is dealing with the flow on impacts to regional communities. Agriculture is frequently the defining character of regional towns and areas, and gives people living there a sense of place and purpose (for example, Hunter wines and Bega dairies).

Flexible and responsive socio-economic assessment models are needed to help choose the best options for the agricultural sector and associated regional economies to adapt business models under climate change.

- Economic analysis of particular agricultural industries will identify critical thresholds of viability and enterprise diversity, and also help identify strategies for producers to adjust successfully.
- The assessments will identify regions and industries where adaptation methods are unlikely to ensure the continuation of economically viable and ecologically sustainable industries.
- The assessments will guide the development of policy options that promote transition to alternative industries, or to alternative land uses.
- These assessments will also guide priorities for further research, development, and extension work.

Currently, a range of models are held by various agencies across jurisdictions that collate current data and interpret these data for strategic policy development and prioritisation of subsequent action. Socio-economic impacts of climate change should explicitly consider both adaptation and mitigation strategies, and the links between them.

Recommendation 6.

That the Commonwealth Government give consideration to developing, in collaboration with States and Territories, socio-economic assessment models for climate change issues that will:

- (a) Assess what it will mean for agriculture and forestry to participate in the proposed national emissions trading scheme (i.e. the Carbon Pollution Reduction Scheme, CPRS).
- (b) Evaluate financial performances of the sub-sectors and regional areas most at risk of difficulty to help resolve the possible implications for structural adjustment.
- (c) Develop policy options that promote transition to alternative industries or to alternative land-uses in given circumstances.

3. INQUIRY TERM OF REFERENCE

- **The role of government in: promoting research, extension and training which assists the farm sector to better adapt to climate change**

and

4. INQUIRY TERM OF REFERENCE

- **The role of rural research and development in assisting farmers to adapt to the impacts of climate change**

Adaptation to climate change is dependent on timely research that accurately identifies the likelihood, and nature, of climate change impacts. Research is also needed into ways of counteracting the effects of projected climate changes (e.g. alternative farming methods, new crop strains, more resilient stock lines). Research findings must then be developed into practical applications for farmers and other primary industries. The results of the research and development must be taken into the field and directly to the practising farmers by high quality extension and training.

The management of risk by producers within the agriculture sector is going to be a critical component for the industry to remain viable and prosperous. Governments can play a role in providing information and advice about risk to support farmers, such as: better seasonal forecasting information, and defining notional zones where the chance of growing a crop is, on average, "x years out of 10" (such as the Goyder line in South Australia).

The NSW Government is currently undertaking a range of activities in relation to climate change research and training.

However, the utility of state- or territory-based data collation and research in relation to climate change is limited. Inter-jurisdictional data will be vital in order to best deal with certain climate change impacts (for example, the spread of pest plants, animals and diseases; the application of farming methods that have already been tested in similar conditions elsewhere in the country).

It is therefore crucial that the Commonwealth Government, through the National Adaptation Research Centre, provide timely national climate change impact projections, which can be adapted by states and territories for their own regional conditions.

The NSW Government strongly supports national developments such as under the COAG National Climate Change Adaptation Framework.

The national Climate Change Research Strategy for Primary Industries (CCRSPI) provides a comprehensive and strategic assessment of the research needs associated with climate change adaptation and should be the basis of the national research agenda.

Agricultural research and development

Agricultural research and development (R&D) has traditionally been conducted by governments, large corporations, industry bodies or various mixes of joint activity. R&D into climate change adaptation is a relatively new field of endeavour. Much of the R&D for climate change, being undertaken, is at a "pure" research stage. Private firms traditionally under-invest in pure research, as the benefits of the research are not easily captured by the proponent. Basic research may have no immediate commercial application and is potentially easily transferable has resulted in direct government investment in R&D programs.

The innovation chain begins with pure research, which if successful, is followed by marketisation and finally market penetration. The marketisation stage involves the demonstration and commercialisation of pure research. For private firms, this part of the R&D process offers great potential rewards as well as significant risks. If the firm is unable to internalise the benefits of its R&D through patents and other market instruments, it risks a spill-over of those benefits to other

firms and competitors. The firm carries the risk of bearing all the costs of demonstration and marketisation, but sharing all the benefits with firms that enter the market at a later date. This is a form of market failure known as the spill-over effect. It discourages early movers from demonstrating and marketing their new technology. Spill-overs can occur at various stages and levels, such as in: knowledge, skills, or meeting regulatory requirements. The spill-over effect can impede R&D and new product development to below optimal levels. Where spill-overs are large, Government support may be warranted. This can be done either through R&D effort in public institutions or by way of financial incentives such as matched funding and tax deductibility of marketisation expenditure.

The high up-front costs of innovation and the risk of failure have led firms in many industries to co-operate through various vehicles such as joint ventures. However, the nature of market competition and the significant legal and administrative costs of joint ventures often discourage collaborative behaviour. This failure of coordination is a market failure that can often lead to a sub-optimal level of innovative activity in the economy. Governments can play a role here in providing a neutral co-ordination role through scientific forums such as the Cooperative Research Centres.

The R&D process requires not only inspiration and skilled personnel, but crucially capital. Investors naturally avoid placing their capital in R&D projects, which by definition are often high risk and difficult to understand. Investors may demand a premium for technical risk simply because they do not really understand the technology. This risk-aversion may limit R&D activity below a socially optimal level. Governments can provide seed funding and other forms of financial assistance to help innovators overcome these capital constraints.

The market failures described here apply with particular force to the farm sector. The industry is largely comprised of family farms, most of which do not have the capacity to conduct structured R&D into adaptation due to the existence of the market failures listed above.

Agricultural R&D strategies now need to consider both the biophysical effects of climate change as well as the implications of policy changes related to the treatment of the agricultural sectors emissions. In some cases there may well be a degree of tension between primary industries adapting to the biophysical impacts of climate change on the one hand, whilst also constraining their level of emissions on the other.

Climate change is super-imposed on a system that has natural underlying variability, with cyclical fluctuations occurring over various time scales. The naturally chaotic nature of climate presents problems for adaptation because there is uncertainty about whether current climate observations are an accurate reflection of longer-term climate change. This might be a particular problem for Australia because there is high level of underlying natural variability that will tend to mask trends.

One consequence of uncertainty is the likelihood that farmers, both with and without R&D and extension, will make adaptation decisions that are not optimal. Farmers might either over or under invest in adaptation if they act on the basis of observations that do not properly predict the longer-term climate. Uncertainty about climate change may also influence farmers' willingness to invest in adaptation, because returns from these investments will also be uncertain.

Because of uncertainties about the extent of climate change and the policy settings relating to the treatment of the agricultural sector emissions, it may be very difficult to produce clear extension messages in the short to medium term. Over this period, both the targeting of R&D, as well as the framing of extension messages, needs to reflect the level of uncertainty in the biophysical and policy environment. Whether current approaches to extension are capable of explicitly considering uncertainty also requires assessment.

Because adaptation and mitigation methods need to be tailored to particular regions, considerable thought must be given to determining how R&D and extension is best undertaken. Economic modelling of different farming systems may help to determine the effectiveness of these options and also aid the allocation of R&D funding.

Recommendation 7.

That the Commonwealth Government increase support for nationally-coordinated climate-change research, development, and demonstration.

- The national Climate Change Research Strategy for Primary Industries could become the national lead coordinating body for all agriculture climate change research;
- The Australian Government should continue to coordinate, fund, and support the priorities produced by, the National Climate Change Research Strategy for Primary Industries (CCRPSI⁷);
- Increase investment in research into adaptation and mitigation strategies and their application by the agricultural sector; and
- the Commonwealth Government should urgently begin regional trials of research outcomes, with the active involvement of local communities.

CONCLUSION

The NSW Government has significant knowledge about the anticipated impacts of climate change on NSW farmers, and has already taken significant steps to assist farmers to adapt to these impacts. However, the extent of climate change impacts which are anticipated to affect Australia's agricultural sector highlight the need for a national approach to adaptation.

The NSW Department of Primary Industries, as one of the agencies on the front-line of dealing with climate change impacts on NSW farmers, considers that the Commonwealth Government could usefully assist jurisdictions to help farmers adapt to the anticipated impacts of climate change through actions outlined in this submission, including:

- directing funding under *Australia's Farming Future* to climate change issues;
- better linking mitigation and adaptation policies, including through the increased involvement of the High Level Officers Group of the Primary Industries Ministerial Council on the development of these policies;
- giving consideration to developing life cycle analysis for agricultural and primary produce;
- focusing biosecurity programs on anticipated agricultural climate change impacts;
- increasing the national coordination of extension services;
- developing socio-economic assessment models of expected climate change impacts; and
- providing greater support for climate change research through the national Climate Change Research Strategy for Primary Industries.

⁷ The CCRPSI was established under the auspice of the Primary Industries Ministerial Council. The strategy is a joint initiative of the Rural Research and Development Corporations, the CSIRO, and the Australian Government, state and territory governments. It is managed by Land and Water Australia, and is funded by the participating bodies, along with industry groups.