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Land & Water Australia

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MANAGING CLIMATE VARIABILITY R&D PROGRAM

17 March 2009

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

Dear Committee Secretary,

Submission by the *Managing Climate Variability* Program to the Inquiry into the role of government in assisting Australian farmers to adapt to the impacts of climate change

The *Managing Climate Variability* Program welcomes the opportunity to make a submission to this Inquiry. There is much to be done and the *Managing Climate Variability* Program is well equipped to assist in delivering to Australian agriculture's needs. The need to improve our ability to manage climate variability through better seasonal forecasting, applications and risk management tools is identified as a priority theme to assist Australian agriculture to adapt under the Climate Change Research Strategy for Primary Industries (CCRSPI). CCRSPI is an initiative of the Primary Industries State Agencies, the Australian Government Department of Agriculture, Fisheries and Forestry, all of the rural Research and Development Corporations and CSIRO.

Under CCRSPI the *Managing Climate Variability* Program is expected to be the Theme Leader for climate variability and seasonal forecasting. *Managing Climate Variability* is a long term partnership of six of the rural Research and Development Corporations and up until 2007/08 the Australian Government. This submission is based on the *Managing Climate Variability Research and Development Strategy 2008-2014* (Attachment 1) which sets out many of the key challenges under the following themes:

- Improving climate forecasts
- Soil, climate and water resources - predicting availability
- Agriculture and fisheries applications
- Knowledge, adoption and communication

The Key Messages we ask the Inquiry take into account are:

1. Australian agriculture, be it through innovation such as the stump jump plough or gene technology for improved wheat varieties or variable rate fertiliser application, stubble mulching, controlled traffic and so on has always been adapting to its

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environment, the demands for increased productivity and improved sustainability. **Adaptation is not new to Australian farmers.**

2. Many innovations, such as the last three cited above are win-win-wins for productivity, sustainability and carbon mitigation. Research to quantify the level of win-win-wins, current uptake and the impediments to further uptake is essential and would assist Australian agriculture in transitioning to these preferred practices. **Quantifying triple-objective practices and opportunities for increased adoption is necessary.**

3. Adoption of improved practices takes time. One of the best ways to foster an accelerated adoption rate of improved practices is through incentives and investments which reduce the barriers and risks (often financial) of adoption. **A triple-objective practice improvement incentive program would well position Australian agriculture for whatever mix of emissions, carbon trading and international agreements are to be implemented in Australia.** Equally importantly, this would improve Australian agriculture's overall resilience by improving productivity and sustainability.

4. Our science capability to accurately predict changing rainfall (and runoff) due to a changing climate is low. Furthermore, with Australia having the most variable climate of any country other than Antarctica, much of the impact of climate change on agriculture is likely to be seen in short timeframes with an increasingly variable climate. **Adaptation timeframes for agriculture are now, not 2070 or even 2030 and are best predicated with more accurate short term climate forecasts.**

5. Many farmers already respond and adapt using climate forecasts. As an example of information uptake, the Water and the Land component of the Bureau of Meteorology (BOM) website that *Managing Climate Variability* co-invests in received over 300,000 hits in November 2008. **For many in Australian agriculture seeking to move to a higher level of adaptation, it is sufficient to meet the challenge of improving the skill in our climate forecasts – multi-week through to seasonal.**

6. For forecasts to be useful for farmers' risk management, planning and decision making they need to be translated into predictive assessments eg – soil moisture, irrigation water availability, fertiliser needs, pasture growth and the risk profile of extreme events – eg frost, heat stress, flood and prolonged drought. **Tools that apply forecasts to identify adaptation strategies within a cropping or pasture cycle will be of increasing importance as climate variability increases under climate change.**

7. Farmer and agribusiness interest in incorporating climate into production strategies is extremely high. Activities such as *Managing Climate Variability's* Communicating

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Climate Change in Agriculture project and as part of that, fostering Masters of Climate (identifying and supporting farmer champions of climate risk management) are in high demand. At the same time, we must make sure that farmers receive precise, regionally relevant, commodity specific, competent and practically orientated climate information. **Consolidated, coordinated and sustained effort in fostering understanding of climate in the farming community, promoting initiatives such as Masters of Climate and supporting knowledge products across all commodities and regions is imperative.**

8. The *Managing Climate Variability* Program and its predecessor, the *Climate Variability and Agriculture* Program has been investing in climate risk management for in excess of 10 years, bringing together skilled science teams in partnership with Australian agriculture. From a program that has relied on a relatively small funding base, the returns have been high and independently evaluated as exceeding a 4:1 benefit cost ratio. **Further investment is warranted.**

The *Managing Climate Variability* Program would welcome the opportunity to make a presentation to the Committee in response to this Inquiry. To progress this dialogue please contact Ms Anwen Lovett, Executive Manager Land & Water Australia at anwen.lovett@lwa.gov.au and 02 6263 6032.

Yours Sincerely

Michael Robinson
Executive Director

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Submission in Response to the Inquiry into the role of government in assisting Australian farmers to adapt to the impacts of climate change

17 March 2009

Prepared by: The *Managing Climate Variability* Program

Submitted by: Land & Water Australia, Managing Agent of the *Managing Climate Variability* Program (on behalf of the *Managing Climate Variability* Program partners)

The *Managing Climate Variability* Program welcomes the opportunity to make this submission as the time is right to investigate and then resource key strategies to support Australia's farmers as they continue to adapt to the challenges of a changing and increasingly variable climate. There is already substantial innovation and adaptation at the enterprise level in managing climate risk, much of which has been fostered through investments by the *Managing Climate Variability* Program and its predecessor, the *Climate Variability in Agriculture Program* over the last 10 plus years.

The *Managing Climate Variability* Program is a collaboration of the Grains, Sugar and Rural Industries Research and Development Corporations, Meat & Livestock Australia, Dairy Australia, Land & Water Australia and up until 2007/08 the Australian Government through the Department of Agriculture, Fisheries and Forestry.

Throughout this submission we refer you to the *Managing Climate Variability Research and Development Strategy 2008-2014* (Attachment 1).

The purpose of the *Managing Climate Variability* Program is to provide more accurate climate forecasts at the time of year and with lead times that are useful for farmers and natural resource managers to make decisions. This purpose translates into research to provide forecasts with more skill and to formulate tools that apply forecasts and other climate information into on-farm management tools. The outcome the program is seeking is farmers and natural resource managers better equipped to make decisions with more reliable climate information so that they can capitalise on opportunities and reduce exposure to climate risk. [Refer *Managing Climate Variability R&D Strategy 2008-2014*, (Attachment 1, page 2, and pages 8 – 17)]

With climate change and water availability headlining Government and Industry agendas across Australia, responding to climate variability and being able to better forecast climate has become an imperative if we are to adapt and respond to climate change. All indications are that as our climate changes, our variability will increase even further. This makes it even more imperative that research investment is targeted, recognises the needs of Australian Agriculture and is well communicated to foster improved water resource management and on- farm practice improvements [Refer *Managing Climate Variability R&D Strategy 2008-2014* (Attachment 1, pages 4 – 7)].

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Following are key points against the Inquiry's Terms of Reference that we wish to make:

Terms of Reference I

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

With regard to downstream impacts, including processes, we refer you to the Sugar Industry Research and Development Corporation's Climate Change R&D Strategy as an example of how industries are thinking through how best to respond to the overall climate change challenges. The following discussion refers more to on-farm issues and the opportunities for continuous improvement in practice.

Many of the practices that can assist the sector to adapt are already available and being adopted by many agricultural producers to achieve productivity and sustainability objectives. These practices are also "climate smart" in terms of both increased resilience to a variable climate and reduced greenhouse gas emissions. Promotion, support and incentives by government programs can assist and increase the rate and extent of adoption of these practices, particularly if the practices are untested in a region, or where there is a capital cost of possible financial risk to the farm business of making the change.

Two examples:

a) Stubble Retention and Direct Drill Cereals Cropping

By retaining stubble in cereals cropping and then direct drilling the next crop the immediate benefits include:

- less likelihood of wind erosion improving overall physical soil health [a sustainability and profitability outcome]
- increased levels of organic matter in soils or soil carbon [a sustainability, profitability and mitigation outcome]
- improved moisture holding capacity thereby increasing moisture availability in the next season, a very useful buffer to perhaps the next season being drier [a resilience to climate variability, sustainability and profitability outcome]
- less diesel consumed as there are less passes over the paddock [a profitability and reduced greenhouse gas footprint outcome]
- to some degree over the longer term as soil health improves, an opportunity for reduced fertiliser applications [a profitability and greenhouse gas outcome].

b) Green Cane Harvesting, Sustainability and Carbon Mitigation – *Reef Rescue*

The "A" practice and to some degree the "B" practices being advocated for the sugar cane industry as part of *Reef Rescue* lead to the following immediate benefits:

- green cane harvesting to maintain harvest flexibility and trash blanketing of soil during harvest to retain soil moisture and increase soil carbon while reducing the likelihood of sheet erosion [sustainability, mitigation and profitability outcomes]
- variable rate fertiliser applications to match inputs to plant needs, reduce the likelihood of volatilisation or export via deep drainage and runoff [greenhouse gas, profitability and

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sustainability outcomes]
- controlled traffic cultivation and precision application of both fertilisers and chemicals for improved soil health, less plant damage, reduced input cost and less passes and fuel use [profitability, mitigation, greenhouse gas and sustainability outcomes].

Terms of Reference 2

The role of government in:

a) augmenting the shift towards farming practices which promote resilience in the farm sector in the face of climate change;

Much has been written through studies of adoption rates of changes in practice that will be of benefit to Australian agriculture. Key criteria for fostering rapid uptake of improved practices include:

- the practices being advocated are of multiple benefits – improving productivity, sustainability and reduced carbon footprint
- the practices must be outcome focussed, fostering and encouraging variations in the practices from an input perspective to meet local conditions while still delivering to the outcomes sought
- innovation is encouraged [noting that "one size fits all" approaches, such as through regulation can discourage innovation]
- the practices have been tested, proven and often are continuing to be improved on-farm by farmers so that there are champions of both the practices and further innovation
- extension methods are multiple to match the various learning styles of farmers – demonstrations, 1:1 advice, field days, expert advice and support, workshops, web-available information etc.

As to the actual rate of uptake, this will vary and can often be accelerated through incentive and capacity building programs. We suggest that a government supported national initiative across the objectives of productivity, sustainability and carbon footprint / mitigation is timely.

b) promoting research, extension and training which assists the farm sector to better adapt to climate change.

Managing Climate Variability recognises as a core role, the need to foster improved Climate Risk Management across the agricultural sector [Refer Attachment 1, *Managing Climate Variability R&D Strategy 2008-2014,* particularly Theme 4 - Knowledge, adoption and communication].

Managing Climate Variability recently led a $0.75M one year project to foster improved understanding of Climate Change and Variability and the opportunities they present in three key agricultural regions – Victorian Wimmera, Eyre Peninsula, SA and North East Agricultural Region, WA. The project was funded through the Department of Agriculture, Fisheries and Forestry. Feedback from farming community participants has been very positive and *Managing Climate Variability* is keen to continue with this activity however the program has been unable to secure further funding. Unfortunately, being partially Government funded, *Managing Climate Variability* was not eligible for the Department of Agriculture, Fisheries and Forestry call for projects under *Farm Ready* which appears to be the funding program that would fund such activities.

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A Checklist of key attributes for any extension and training activities, as extracted from the Executive Summary in our Final Report from this project to the Department of Agriculture, Fisheries and Forestry is provided below. In *Managing Climate Variability's* experience all these components must be met if the extension and training is to be effective:

1. ***Coverage***
   - *Commodities*
   - *Regions*
   - *Farmers, agribusiness consultants and agency extension staff*
   - *Whole of enterprise*
2. ***Science competence and credibility***
   - *Quality assured science*
   - *Strong links to existing information provision*
   - *Good science communicators*
   - *Linked to local knowledge providers*
3. ***Knowledge support tools***
   - *Web based knowledge resource*
   - *Printed material*
   - *Interactive and mediated discussions*
   - *Formal and informal networks*
4. ***Competent and Australia-wide coordination***
   - *Knowledge of user needs*
   - *Industry credibility*
   - *Flexibility*
5. ***Covering various learning styles and needs***
   - *Masters of Climate fostered and resourced*
   - *Farmer knowledge*
   - *Specifically tailored products*
   - *Ongoing support*

While the *Managing Climate Variability* Program has been unable to secure further Australian Government funding for its capacity and extension activities, the program is continuing to fund a number of it projects with its partner funds that support capacity building and access to climate information by the farming community. These include:

- cash support via our partner rural Research and Development Corporation's for several producer groups applying for *Farm Ready* assistance
- Development of the *Climate Kelpie* website, with its first phase now ready for launching. This website *"rounds up"* climate information and tools for farmers in a format they have told us is of most use to them
- continued investment in the Masters of Climate concept which fosters (through the provision of support, exposure to new climate science/knowledge/implications for agriculture, coaching and creating opportunities) for champions within commodity groups to interact with their colleagues (talk to local farming groups etc) to encourage the adoption of climate risk management
- publication and extensive distribution of our magazine *Climag*

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- further investment in the Bureau of Meteorology's (BOM) *Water and the Land* component of their website which already receives substantial farmer use and with the proposed Data Drill so farmers can interrogate BOM stations near them and compare BOM records with their own, we envisage even further use of all the products on WATL
- prototype development of an Ask an Expert component of the *Climate Kelpie* website, especially in the first phase around interpreting the official seasonal forecasts in the context of selected Global Circulation Model projections.

Much remains to be done. Particularly the *Managing Climate Variability* program would like to explore with the Inquiry the opportunity to ramp up our modest investments in training and then supporting Champions in all key commodities as *Masters of Climate*.

Terms of Reference 3

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

The *Managing Climate Variability* Program and its predecessor, *Climate Variability in Agriculture Program* have over 10 years of track record in investing in seasonal forecasting science and delivering it to farmers in the form of climate risk management outcomes (tools, knowledge and capacity) with an enviable benefit:cost ratio in excess of 4:1.

The themes of our *Managing Climate Variability R&D Strategy 2008-2014* summarise what we believe are the key R&D opportunities as Australian agriculture adapts to the more variable climate that is predicted to accompany our changing climate. These themes of investment are summarised as follows:

Theme 1 Improving climate forecasts

The *Managing Climate Variability R&D Strategy 2008-2014* is concentrating much of the program's investment in improved forecasts. This is because feedback from our industry partners (rural Research and Development Corporations) is that their levy payers identify current weakness in forecast skill and timeliness are a key constraint to increased adaptation to climate.

More accurate forecasts mean both spatial and temporal improvements. Australia needs forecasts that are more precise to a region and therefore to the commodities and on-farm practices of those regions. Likewise, Australian Agriculture needs more accurate forecasts in the multi-week to many month timeframes and if ever possible, accurate inter-annual forecasts.

The Program in its science planning has identified a series of key R&D opportunities to improve forecasting. These and their status in terms of investment are listed in Attachment 4. Clearly more investment would be useful. At the same time, there is a limited science capability in Australia. Therefore one of our strategies must be to forge closer links and interaction with researchers overseas. POAMA, Australia's Global Circulation Model must be improved and it must benefit from international collaboration.

POAMA was initiated through research investment by *Managing Climate Variability's* predecessor, the *Climate Variability in Agriculture* Program and has had substantial BOM investment over many years. Only through Australian investment and Australians researching will we develop forecasts

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and predictions that understand both the Australian environment and the Australian user needs. BOM is the logical home for Australian climate research and the recent linking of BOM with CSIRO in the centre for Australian Weather and Climate Research has strengthened the BOM role.

For POAMA to reach its full potential, collaboration internationally is important. For example BOM has developed an Agreement with the Hadley Centre, its UK equivalent. Further, in determining Australian forecasts, the National Climate Centre within BOM incorporates outputs from selected international Global Circulation Models. However, if investment is not made to continually improve POAMA to meet Australian user needs, Australia will have to rely on forecasts derived by another country which will have reduced relevance and applicability to Australian conditions.

As we have learnt more about our climate we are building an understanding of the earth as a linked system. Key Climate Drivers for Australia include El Niño-Southern Oscillation [Pacific Ocean], India Ocean Dipole [Indian Ocean], Southern Annular Mode [Southern Ocean], Madden-Julian Oscillation [tropics and equatorial]. These interact and the challenge is to predict how they will interact with changing ocean and atmospheric conditions. This can only be achieved using Global Circulation Models. These models not only better reflect what drives our climate but are based on current conditions, compared to existing statistical approaches which rely on trying to predict this year based on past years. If we accept we have a changing climate statistical approaches will no longer be useful for forecasting.

Mainstreaming Global Circulation Model outputs into routine forecasting is a parallel and essential activity. Therefore most of the R&D projects *Managing Climate Variability* invests in include as part of their final phases, the integration of research outputs into routine BOM National Climate Centre products. A good example is our current project on multi-week forecasting, to provide forecasts beyond four day "weather" and of shorter timeframe than the current seasonal forecasts. This is because POAMA is exhibiting excellent skill at this timeframe and equally importantly, if we can foster application of multi-week forecasts in on-farm activities then flow-ons to on-farm application of longer term forecasts are likely to be substantial and of course key to improved on-farm adaptation to a changing and more variable climate.

The benefits of improved forecasting are multiple and across all sectors that interact with the Australian natural environment - fishing, agriculture, mining, infrastructure, emergency services, transport, urban water and energy supply to name key sectors. The recently completed *Managing Climate Variability* Eastern Australia Climate Forecasting Science Plan in its interaction with agricultural users found the following key agricultural opportunities:

- Development of innovative insurance systems including new approaches to multi-peril crop insurance and extreme events with integration into new developments in climate forecasting will greatly assist with the resilience of numerous industries in eastern Australia. For example, just one extreme event cost the Lockyer Valley horticultural industry about $20 million in 1996. Innovative climate forecasting and innovative risk management systems are urgently required.

- Horticultural industries – temperature sensitive planting decisions for lettuce affects three of

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the sixteen lettuce plantings each year, or 20% of the total crop and would greatly benefit from more useful and targeted climate forecast systems for planting management, which could lead to savings of $5 million a year in one region alone (Lockyer Valley). The lettuce industry in the Lockyer Valley generates $50 million a year, with a potential gain of $5 million a year through improved climate forecasts of temperature.

- Tactical management needs for industries such as cotton – harvesting/picking operations in eastern Australia is a practice that would greatly benefit from improved multi-week forecasts. Multi-week forecast systems based on improved understanding of synoptic features could result in 15%-20% savings for this industry in eastern Australia. Additional savings of 5% shortfall in gross margins would result from improved capability to avoid re-spraying a fungicide due to the product otherwise being washed out by rain.

- Crop or fallow management decisions, variety decisions, and crop/grazing mix decisions using skilful and timely forecasts are just some of the examples of management systems that would be greatly aided by improvements and appropriate integration of climate-grain-grazing systems with key management decisions. Conservative estimates place this value at $250 million per annum or higher, even with a moderate uptake of information by farmers. For the wheat industry as an example, improvements in climate forecasts of frost at anthesis (and known before planting) could result in savings of $450/ha.

These are just a few examples of the potential gains from improved forecasts for one part of Australia which will build the resilience and productivity of those industries which will assist them to adapt to climate change. Further examples are in *Managing Climate Variability R&D Plan 2014* and the recently prepared *Managing Climate Variability* Northern Australia Climate Science Plan.

Managing Climate Variability would be happy to elaborate on Australia's forecasting R&D priorities and how we might best deal with Australia's limited science capability to the Committee.

Theme 2 Soil, climate and water resources - predicting availability and
Theme 3 Agriculture and fisheries applications

While many farmers will base their decisions on improved spatial and temporal forecasts, many of our leading farmers and certainly agribusiness consultants and policy makers need forecasts translated into applications. Key applications and opportunities are detailed within the *Managing Climate Variability R&D Strategy 2008-2014*.

Ideally, with improved forecasts our predictions for key and fundamental attributes will also be improved, for example:

- runoff to water storages – key to setting water allocations and demand management strategies in both urban and rural contexts
- opportunities for high river flows and floods – key to maximising benefits of flows allocated for the environment
- soil moisture – setting the context for crop selection, fertiliser application rate and follow on plantings such as a cereal crop to follow an irrigated cotton crop
- fish and prawn / lobster populations recruiting to the commercial fishery – the basis upon which to set effort controls for the forthcoming season
- pasture growth and availability – as a basis for stocking rates and movement

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- likelihood of frost or heat stress – setting the parameters for crop or variety type and harvest planning
- likelihood of a severe wet season in the tropics – underpinning infrastructure works and development scheduling.

The list of applications and potential efficiencies and opportunities spans the breadth of our endeavours linked to Australia's natural resources. Much needs to be done. Some successes are already evident such as AussieGrass, Rainman and Yield Prophet – all benefiting from previous *Managing Climate Variability / Climate Variability in Agriculture Program* investments.

Because the opportunities are multiple and the resources in our program are very limited, *Managing Climate Variability* is undertaking a stocktake of Tools as the basis for defining the directions for the next tranche of our investment in this space. An update of this process and findings to date can be provided as part of a presentation to the Committee.

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Attachments

1. *Managing Climate Variability Research and Development Strategy, 2008 – 2014;*

2. *Climag* 16, Jan 2009 – as an example of our routine Newsletter circulated to farmers and researchers

3. Sample Fact Sheets as prepared during *Communicating Climate Change* project for *Masters of Climate* forums

4. Summary Table – status of Forecasting R&D investment

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