Grains Research & Development Corporation

30 March 2009

Adapting Farming to Climate Change- Inquiry
House of Representatives Liaison and Project Office
PO Box 6021
Parliament House
CANBERRA ACT 2600

ADAPTING FARMING TO CLIMATE CHANGE

In response to the House of Representatives inquiry, the Grains Research and Development Corporation (GRDC) believes that key issues in current and future adaptation, and the role of government and Research and Development Corporations (RDCs) in facilitating adaptation to climate change can be summarised below:

- The Australian agricultural industry already deals with high levels of variability in climate and seasonality and has substantial adaptation capability already in place

- Adaptation by farmers will be an ongoing issue

- The GRDC has current investments and has identified future investments for adaptation to climate change at the small scale (gene to farm) and the large scale (farm to continent) and can play a leadership role across the rural industries

- Prospective adaptation to climate change by farmers will occur by managing risk through farm management practices, improving seasonal forecasting and spreading risks to sectors better adapted to a changed climate

- Where adaptation requires changes to the geographic location of agriculture, downstream impacts will occur in areas of infrastructure, labour, and social dynamics

- The government's role in assisting in adapting the farming sector to climate change should be through providing continued support of research, development and extension, coordination of RDC models and, where required, the implementation of appropriate regulatory frameworks.

- Research, Development and Extension (R,D&E) is required to provide:

  1) Validated outcomes in the areas of:

     a. Decision support tools, models and improvements of forecasting

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b. Farming system adaptation (Risk management technology in agronomic practises, crop varieties, biotechnology and infrastructure)

2) Corporate governance and strategic direction for targeted research through a collaborative RDC model

3) Communication and extension to ensure knowledge is accessible for farmers to adapt to the challenges of climate change

The GRDC Climate Change Strategy

The rural industries have, and always will, face the challenges presented by climate change. The GRDC has developed a strategy which addressed both adaptation to climate change and mitigation of greenhouse gas emissions.

The overarching objectives of the strategy are to have prosperous growers adapting to climate change and the mitigation of on-farm greenhouse gas emissions. Four areas have been identified in which targeted activities for adapting and mitigating the impacts of climate change have been identified. These are:

1) Understanding the impacts of climate change at the scale of agro-ecological zones

This involves the downscaling of climate change models to the scale of agro-ecological zones.

2) Developing plants, crops and farming systems better able to adapt to climate change

This involves an examination of plant and crop responses to elevated CO_2, increased temperature and variable rainfall and the identification of desirable plant traits that can be included in breeding programs.

Collaborative farming systems adaptation efforts will also need to occur across other GRDC investments that aim to achieve natural resource and productivity outcomes through improving water-use efficiency and allowing the achievement of catchment goals in partnership with other industries involved in mixed farming systems.

3) Develop practices that minimise on-farm greenhouse gas emissions

Nitrous oxide emissions vary across agro-ecological zones and farming systems. Opportunities to reduce emissions will be explored and could include plant improvement of nitrogen-use efficiency and agronomic practices that maintain soil nitrogen.

Soil carbon also offers potential sequestration opportunities for CO_2 as well as improving soil condition and fertility for crop production. Life Cycle Analysis (LCA) is the valuation of environmental impacts of a product caused by its existence and is becoming a standard method of evaluating the CO_2 equivalent emissions from the production of a product. LCAs for key grain products are needed to allow industry to demonstrate how it is managing its greenhouse gas "footprint".

4) Improvement of grower's capacity to adapt to climate change and mitigate emissions

For growers to adapt to climate change and mitigate on-farm emissions they need to be aware of the potential impacts, and management opportunities, have the capacity to change practices and be motivated to do so. This strategy is about communication and building capacity in the industry.

This strategy has been developed within the Climate Change Research Strategy for Primary Industries (CCRSPI). CCRSPI has made a separate submission, supported by the GRDC as a participating member. The GRDC submission outlined below attempts to provide a more focussed grains industry perspective and indentifies key issues of importance to the rural industries.

Please do no hesitate to contact GRDC on (02) 6166 4500 for any further information on this submission.

Yours sincerely

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House of Representatives Inquiry: Adapting Farming to Climate Change
GRDC Submission

Large Scale Adaptation: Current

The impacts of climate change have been modelled on a global and continental scale. Some effort has been made to downscale impacts using either the range of CSIRO models or other simpler modelling approaches such as that for the location of the Goyder Line in South Australia (The Goyder Line represents the boundary between cropping and grazing activities in Southern Australia). Figure 2 demonstrates the potential shift in Goyder Line modelled on the parameters of CO_2, temperature and rainfall.

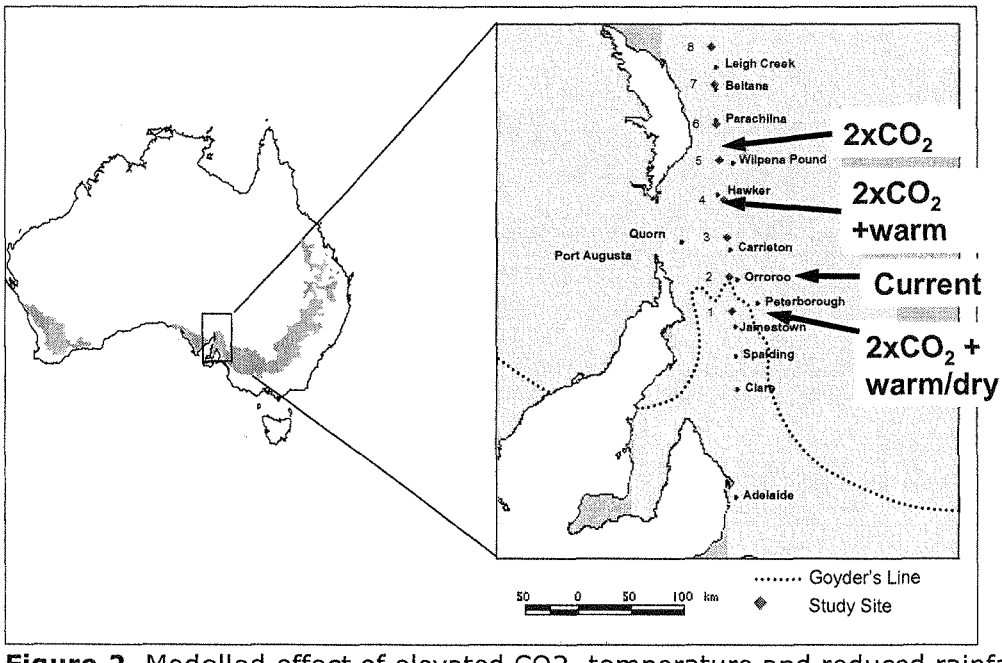

Figure 2. Modelled effect of elevated CO2, temperature and reduced rainfall on the location of Goyder's Line in South Australia

A more recent study on the Eyre Peninsula of South Australia examines the predicted impacts on grain yield of a range of future temperature and moisture regimes (Figure 3).

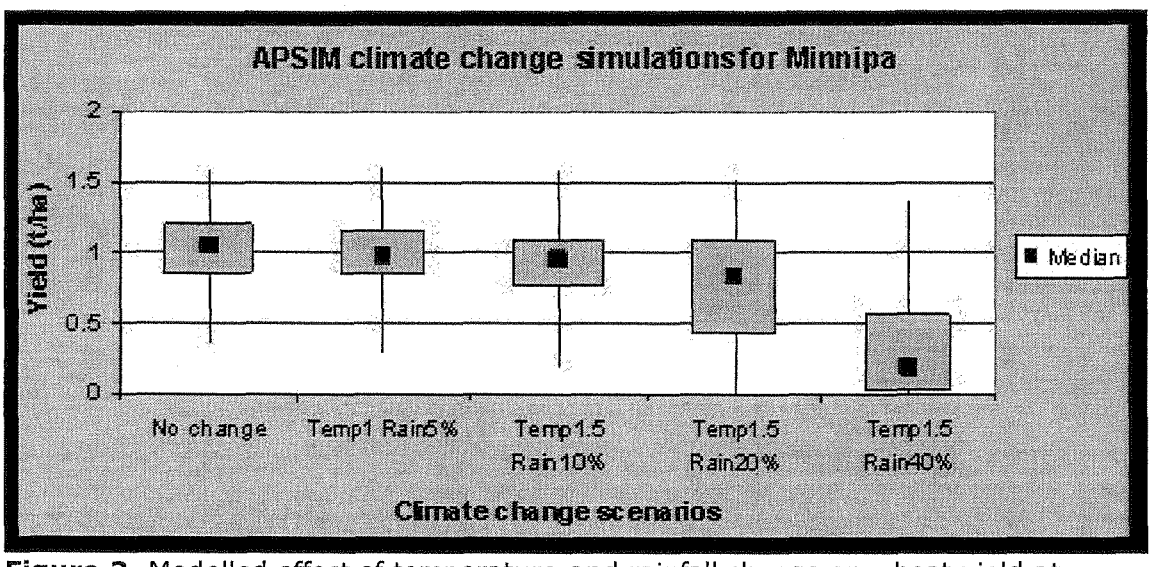

Figure 3. Modelled effect of temperature and rainfall change on wheat yield at Minnipa SA (After Doudle *et al.* 2008).

The study concludes that "...there are businesses in low rainfall areas which have gone through the last five years of very challenging seasons and are still in a strong financial, environmental and social position". Considering the most likely climate change scenarios are better than the conditions over the last 5 years... "there is a future for agriculture on the upper Eyre Peninsula for the mild to moderate climate change scenarios which are most likely over the coming decades."

A key message on climate change is not to be alarmed. The current two year drought is a combination of both climate change and similar seasonal variability to those experienced historically. Good seasons will occur over the next 20 years and there will be time for those businesses that survive the current drought to adapt to the mix of climate change and variability.

Large Scale Adaptation: Future

Managing variability within the season remains the most powerful method for growers to adapt to climate change. One half of Australian grain growers take into account seasonal climate forecasts in farm management. Increasingly growers are delaying large investments in fertiliser as they wait to see how seasons progress. Managing in the context of the season is in effect a practical adaptation to climate change.

Despite being the most valuable tool, current levels of understanding of within season variability are of marginal value for individual growers in making decisions for their farm businesses due to a lack of predictive power. The El Niño Southern Oscillation (ENSO) /Southern Oscillation Index (SOI) models (see Figure 4) have the greatest power with 58% of seasonal variability explained by these models. When these tools are used by a skilled operator, a benefit of $8/ha can be gained in some areas of Australia.

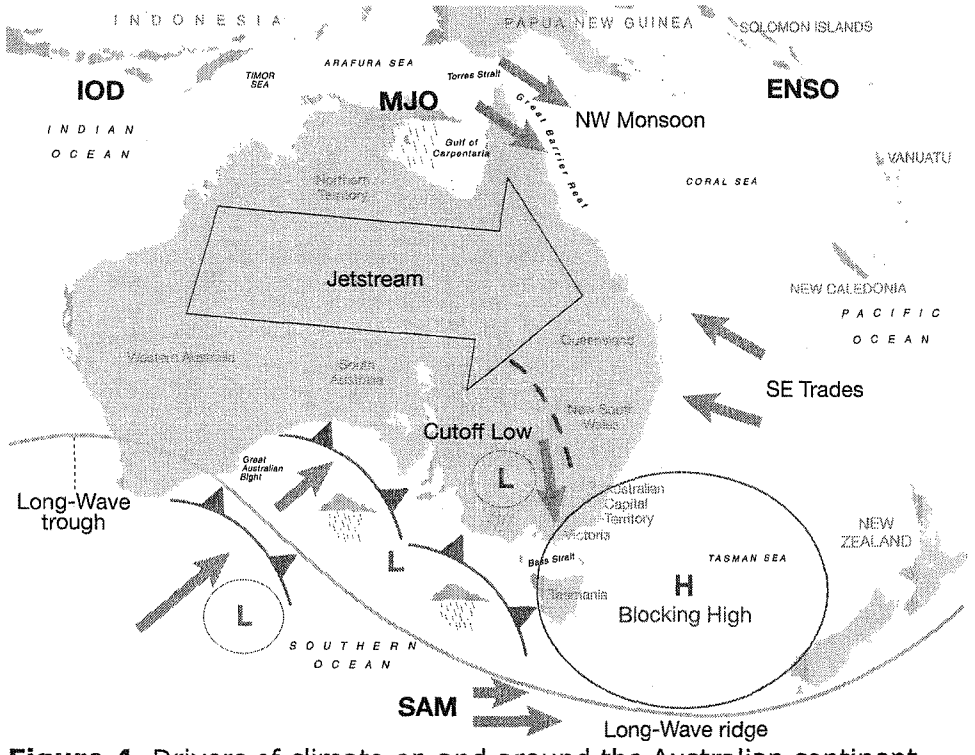

Figure 4. Drivers of climate on and around the Australian continent

There is however still debate over the usefulness of improving forecasts. It can be argued that a reliance on seasonal forecasting leads to farmers investing less into risk management strategies making their businesses vulnerable when the forecasts are wrong.

To avoid a shift away from on-farm risk management in favour of better seasonal forecasting, emphasis on improving our understanding of the drivers of climate change have been focused on. The GRDC has been the major partner in the Managing Climate Variability (MCV) Program. MCV has made a separate submission to the inquiry with GRDC support as a program partner.

MCV investments look to develop multi-faceted approaches through tools to allow grain growers (and others) to better manage the risks associated with within season climate variability. This has included investment in the development and adaptation of climate models for use in agricultural decision making and the development and extension of decision support tools to assist growers in decision making. The second phase of MCV has strong investment in understanding the regional drivers of climate with greater emphasis on global circulation models rather than statistical forecasts which have a clear 'skill limit'. The management of within-season variability will however, remain the main means by which grain growers adapt to climate change.

Future work in climate variability must take into account the fact that improvements in this area are dependant on growers' existing knowledge of the use of this technology. Effective communication will thus be a major determinant of the extent to which improved predictions of seasonal variation will resolve uncertainty leading to less risk to farming enterprises.

Small Scale Adaptation: Current

Given the history of steady growth in productivity in the grains industry over the last 30 years, and the inherent variation associated with climate change

projections, the total area under crop in Australia is unlikely to change markedly over the next twenty years. With an increase in emphasis on risk management and small-scale adaptation responses (such as better adapted cultivars and more water use efficient practices), small yield increases of the order of 1% p.a. may actually occur based on current climate change scenarios (IPCC4). Current models predict that the location of grain production is likely to shift in the future and major shifts are likely to occur in Western Australia. More grain is predicted to be grown in the higher rainfall zones and less in the low rainfall zones accompanied by a shift to greater pastoralism in the eastern wheat belt. Some argue that more efficient production systems will allow cropping to continue profitably in the eastern wheat belt, but this will depend on the magnitude of change. Grain production is also likely to increase in the higher rainfall zones of NSW, Victoria and Tasmania.

For the farming sector, risk management strategies are the most immediate way for farmers to adapt to climate change. This can occur at either the large scale (diversification of enterprises) and the small scale (changes to agronomy practises and plant breeding) and offer a method for buffering the impacts of climate change on farm viability. Small scale adaptation options are more easily implemented. However, there are dependencies on having:

- Confidence that climate impacts are actually occurring
- Motivation for change due to a high level of risk
- Clear benefits for adoption of new technology and;
- Infrastructure and government policy in place to support the adaptation

Current programs funded by GRDC in risk management focus on:

- Soil conservation
- Cropping and stubble management
- Better decision support tools
- Better cultivars which are more water efficient, more drought tolerant, require less nitrogen, have better pest and disease tolerance and are more responsive to elevated CO_2.

Other potential impacts of climate change which are being considered in adapting farming to climate change by GRDC include:

- a shift in the pattern of growth of adapted varieties
- higher rainfall zones become more profitable for cropping with reduced incidence of water-logging
- increased opportunities in northern Australia, resulting in greater grain production, either in summer crops or irrigated dry season crops (the environmental consequences of agricultural development in northern Australia may slow this trend however).

Small Scale Adaptation: Future

For individual farm businesses, shifts in climate will be subtle as climate change will be masked or sometimes exacerbated by normal seasonal variability. Future research will need to provide individual growers with better seasonal forecasts and decision support tools to make management decisions as each season progresses. Given that statistically based forecasts have reached the limits of their predictive skills, it is important that improved models based on an understanding of the drivers of climate are developed.

Continued work in development of on-farm risk management practises and varietal improvements which take into account any new information on climate

impacts is required. The GRDC strategy for facilitating adaptation to climate change ensures continuation of breeding varieties, as well as providing information and education in the adoption of transgenic technology to cope with climate change impacts (such as increases in temperature, CO_2 and changes in rainfall patterns).

The strategy for facilitating adaptation will also encourage education and training in areas where government legislation will impact on farm management practices (such as the potential introduction of the emissions trading scheme and carbon accounting to the farming sector).

Downstream impacts of adapting to climate change: Current

The grains industry operates in a competitive global market. Climate change will not only impact Australian growers but also our competitors. Canada. USA, Eastern Europe and South America each have different climate change scenarios– some favourable, others not so favourable. The test of Australian growers' competitiveness will be in how we adapt to changes affecting our own industry relative to our competitors.

The effect of climate change will also be variable in areas of rural infrastructure. At the farm level, depreciated machinery can be replaced appropriately in response to climate change. At the receival, storage and transport levels, grains infrastructure is becoming increasingly flexible with the use of road rather than rail transport and temporary storages rather than concrete silo systems all of which are highly adaptable to climate change. The level of central storage requirement may be reduced under this scenario and will have downstream effects on the bulk handlers of grains.

Downstream impacts of adapting to climate change: Future

The downstream impacts of climate change in the future will begin to take effect in the coming years as farmers take decisive steps towards modifying their business.

While there is a degree of flexibility in some farm-related infrastructure, where that level of flexibility does not exist (such as grain receival facilities and transport infrastructure), demands for manual labour will increase. The ability for the agricultural sector to meet increases in demand for labour will depend on appropriate training and incentives being in place to allow succession planning and continued availability of a skilled work force. The government can play a role by providing incentives and subsidies in areas of the rural sector that will encourage capacity to remain in the agricultural industries.

The role of R&D in helping farmers adapt to climate change

GRDC and other RDCs have a leadership role in adaptation to climate change. Research and Development Corporations offer a co-ordinated approach whereby wide consultation with stakeholders and the farming sector can be utilised to best position the industry for climate change. Implementation of government frameworks will also be a core responsibility of RDCs as a whole. Identifying uncertainties and providing education will be a necessary role by RDCs to allow growers to meet the requirements of the government, and provide the best strategies for incorporation of government frameworks to ensure win-win scenarios. The Climate Change Research Strategy for Primary Industries (CCRISPI) plays a crucial role in this.

Research and development is required to deliver targeted research for large and small scale adaptation in specific industries to climate change. GRDC delivers research specific to the grains industry and maintains effort in areas identified by stakeholders as priorities.

Research and development through RDCs has a proven track record and through ongoing support from government and rural industries will enable optimum adaptation to climate change.

The role of government in augmenting resilient farming systems in climate change

The government has a clear role to play in sustaining the Australian economy as the impacts of climate change continue to take effect.

Primarily the greatest area of effect will exist in funding of areas of clear market failure or of public benefit in the rural industries. Extension and education is then required to ensure uptake of the outcomes of investments in the rural industries.

The provision of funding and frameworks which assist in legislating adaptation by the rural industries is also an essential part of the government's role.

The key message is that government needs to continue to invest in research and development for adaptation of the Australian rural industries to meet new demands arising from the impacts of climate change.

References

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