

GRDC climate research in a nutshell

GRDC is funding research on aspects of climate change and farming practices to respond to it. The research is summarised here. For more information on these projects, please get in touch with the appropriate contacts listed below the project summary.

Understanding the impact of climate change

Assessing greenhouse gas emissions in cereal-legume cropping systems in southern Australia

Project number: DAV00081

July 2006 – December 2009

Cropping is on the increase in southern Australia and the associated increased use of nitrogen fertiliser could increase levels of greenhouse gas emissions, in particular nitrous oxide. Much of the research to date has been on acid soils and for crops grown with synthetic fertiliser. This project measured emissions from farming systems on alkaline soils using nitrogen derived from legumes, which is more typical of southern Australia. The results are still being analysed; however, DPI is likely to recommend that growers replace some synthetic nitrogen fertiliser with plant legumes in medium-rainfall areas, and use urease inhibitors in high-rainfall areas.

Contact: Mr John Graham, Department of Primary Industries, Victoria, (03) 5573 0908, john.graham@dpi.vic.gov.au

Soil type, carbon dioxide and wheat yields in Western Australia

Project number: DAW00088

July 2003 – July 2007

This project showed that, under normal farming practices in the Western Australia wheat belt, soil type and climate influence the amount of carbon dioxide released into the atmosphere. It also showed that the benefits of higher concentrations of carbon dioxide in the atmosphere were more than offset by the effects of lower rainfall, delayed sowing and higher temperatures.

Contact: Dr Ian Foster, Department of Food and Agriculture, Western Australia, (08) 9441 8109, ian.foster@agric.wa.gov.au

Measuring paddock-based greenhouse gas emissions from wheat production

Project number: DAW00103

December 2003 – June 2009

How does applying nitrogen fertiliser to wheat crops contribute to of nitrous oxide emissions from the soil? This project showed that it results in low emissions of nitrous oxide, but that urea is a big source of greenhouse gas emissions on farms. Project UWA00131 is studying the effects of using less urea in growing wheat.

This project has also showed why it's important to use region-specific data when developing strategies for minimising emissions.

Contact: Dr Daniel Carter, Department of Agriculture and Food Western Australia, (08) 9368 3408, dan.carter@agric.wa.gov.au

The effect of higher levels of carbon dioxide on wheat

Project number: UM00027

June 2006 – June 2010

Researchers are conducting field studies in Victoria on the effects of higher levels of atmospheric carbon dioxide on wheat. Studies to date were conducted overseas and the results may not apply to

Australian climates and soils. Modellers can use the data collected to predict how grain crops across Australia are likely to respond to higher levels of carbon dioxide in the atmosphere.

Contact: Dr Michael Tausz, University of Melbourne, (03) 5321 4310, michael.tausz@unimelb.edu.au

Estimating greenhouse gas emissions when converting pasture to wheat

Project number: UM00028

June 2006 – January 2009

Nitrogen dynamics on land that is being converted from pasture to wheat cropping are not well understood. Researchers studying emissions of nitric oxide and ammonia found a way for farmers to estimate their emissions of nitrous oxide and found that farmers can use a urease inhibitor to reduce their greenhouse gas emissions.

Contact: Dr Robert Edis, University of Melbourne, (03) 8344 7131, roberte@unimelb.edu.au

Reducing greenhouse gases emissions

Can dairy farmers in south-eastern Australia use nitrogen inhibitors to reduce nitrous oxide emissions from urine?

Project number: DAV00097

May 2009 – June 2012

If dairy farmers can use nitrogen inhibitors to slow down the nitrification process in soils growing pastures, they can reduce the amount of nitrous oxide emitted from urine on their pastures, thus reducing their overall greenhouse gas emissions.

Contact: Mr Kevin Kelly, Department of Primary Industries Victoria, (03) 5833 5359, kevin.kelly@dpi.vic.gov.au

A standard way of measuring nitrous oxide emissions from Australian agricultural soils, and management strategies for reducing emissions

Project number QUT00002

March 2009 – February 2012

This project is standardising the way in which nitrous oxide emissions are measured in a number of Australian agricultural industries, and developing management strategies for reducing nitrous oxide emissions. A web-based database of nitrous oxide emissions from a number of experimental sites is also being developed.

Contact: Dr Peter Grace, Queensland University of Technology, (07) 3138 9283, pr.grace@qut.edu.au

Reducing nitrous oxide emissions from irrigated grains-cotton farming systems

Project number: QUT00003

March 2009 – February 2012

To help growers reduce their greenhouse gas emissions, researchers are working to understand better the roles of water and nitrogen in creating nitrous oxide emissions and storing carbon in the soil on irrigated grains-cotton farms. The data they collect will inform consulting agronomists and will be used in the development of the National Carbon Accounting System.

Contact: Dr Peter Grace, Queensland University of Technology, (07) 3138 9283, pr.grace@qut.edu.au

Reducing nitrous oxide emissions from sugarcane lands

Project number: SRD0003

March 2009 – June 2012

Researchers aim to understand how different management techniques used on sugarcane farms affect nitrous oxide emissions. They will recommend ways in which cane farmers can reduce their greenhouse gas emissions.

Contact: Dr Weijin Wang, Sugar Research and Development Corporation, (07) 3896 9585, weijin.wang@derm.qld.gov.au

Using enhanced-efficiency fertilisers to reduce greenhouse gas emissions

Project number: UM00037

June 2009 – June 2012

By identifying which intensive agricultural industries benefit most from using enhanced-efficiency fertilisers (EEFs), growers may be able to use less fertiliser, thereby lowering their nitrous oxide emissions. Guidelines for using EEFs will be made available for each industry being studied.

Contact: Prof. Deli Chen, University of Melbourne, (03) 8344 8148, delichen@unimelb.edu.au

Using pulses and improving nitrogen management to reduce nitrous oxide emissions

Project number: UNE00012

May 2009 – April 2012

Do greenhouse gas emissions change depending on whether growers apply nitrogen as synthetic fertiliser or via legume crops, and how? This project will explain the dynamics of nitrogen conversion in dryland cropping. The knowledge will help farmers manage their nitrogen use to reduce their emissions while maintaining crop yields and soil health.

Contact: Dr Graeme Schwenke, Primary Industries Innovation Centre, (02) 6763 1137, graeme.schwenke@industry.nsw.gov.au

Using lime and/or grain legumes to reduce greenhouse gas emissions in wheat production

Project number: UWA00131

May 2009 – February 2012

Urea is a big source of greenhouse gas emissions on wheat farms (see project DAW00103 above). This project will ascertain if growers can reduce emissions by applying lime and/or by rotating wheat with a grain legume (such as lupins) instead of using urea.

Contact: Dr Louise Barton, University of Western Australia, (08) 6488 2543, louise.barton@uwa.edu.au

Storing carbon in the soil

Measuring the carbon content of Australian soils and for agricultural land uses

Project number: CSA00019

April 2009 – June 2012

Researchers will provide the National Carbon Accounting Scheme with nationally consistent data on the carbon content of major Australian soils and for major agricultural land uses. The data will also inform farm management practices. The project integrates four sub-projects—see Annexes D1, D2, D3 and D4 below.

Contact: Dr Jeff Baldock, CSIRO Land and Water, (08) 8303 8537, jeff.baldock@csiro.au

Storing carbon in the soil in Western Australia – which agricultural regions show most promise?

Project number: CSA00019 Annex D1

May 2009 – June 2012

Researchers will identify which agricultural regions of Western Australia can provide the biggest increase in carbon storage in soils, and provide extension materials to help farmers manage their soils

for carbon storage and better soil health. The data collected will feed into Australia's national carbon accounting models and the Western Australian database of agricultural soils.

Contact: Assoc. Prof. Daniel Murphy, University of Western Australia, (08) 6488 7083, daniel.murphy@uwa.edu.au

Soil carbon in cropping and pasture systems of Victoria

Project number: CSA00019Annex D2

July 2009 – June 2012

Researchers will recommend the best land uses for different soil types so that farmers can manage rapid changes in land use while maximising the potential for storing carbon in their soil over the long term.

Contact: Dr Fiona Robertson, DPI Victoria, (03) 5573 0900, fiona.robertson@dpi.vic.gov.au

How pasture type and management practices affect soil carbon stocks in grazing lands of northern Australia

Project number: CSA00019 Annex D3

April 2009 – June 2012

To be able to adapt their management practices to climate change, graziers in northern Australia need to understand how natural factors and human activity affect the long-term storage of carbon on their grazing lands. The data collected will also feed into the National Carbon Accounting System.

Contact: Dr Ram Dalal, Department of Environment and Resource Management, (07) 3896 9895, ram.dalal@derm.qld.gov.au

Measuring, monitoring and determining the viability of storing carbon in agricultural systems in New South Wales

Project number: CSA00019 Annex D4

June 2008 – 2012

This project will find out how changing farm management practices could change the structure of carbon in agricultural soils in New South Wales. Data collected will feed into the National Carbon Accounting System.

Contact: Prof. Annette Cowie, University of New England, (02) 6773 3924, annette.cowie@une.edu.au

Storing carbon in cropping systems in Queensland and the effect of no-till practices, rainfall and soil type

Project number: 12361

June 2009 – June 2012

Researchers will identify how much carbon is stored long term in the soil in grain and sugarcane farms in Queensland under conventional and no-till practices, and with different levels of annual rainfall. They expect the results to lead to an increase in no-till farming, which will benefit farmers and improve soil health. The data collected will form part of the national account of greenhouse gas emissions.

Contact: Dr Ram Dalal, Department of Environment and Resource Management, (07) 3896 9895, ram.dalal@derm.qld.gov.au

Adapting to climate change with varieties

Drought-tolerant wheat suitable for the Australian environment

Project number: CIM00010

January 2003 – June 2008

Australian farmers now have access to more drought-tolerant wheat varieties, and Australian breeding programs can release new varieties each year with better yield performance. The researchers created genetic plant material with better drought tolerance than existing genetic material used for breeding wheat, and in December 2007 sent it to Australian wheat breeders.

Contact: Dr Yann Manes, International Maize and Wheat Improvement Center (CIMMYT), Mexico City, +52 555 5804 2004 (Mexico), y.manes@cgiar.org

Drought-resistant wheat strains for the northern region

Project number: CSP00053

March 2004 – June 2009

This project identified genetic material for creating more drought-resistant strains of wheat which plant breeders can use to provide growers in summer-dominant rainfall environments with a more reliable supply of higher yielding wheat with larger and more uniform grain weight.

Contact: Dr Ray Shorter, CSIRO Sustainable Ecosystems, (07) 3214 2920, ray.shorter@csiro.au

Wheat and barley genetic material for breeding for heading date and frost tolerance

Project number: CSP00071

October 2005 – October 2008

Australian breeders now have wheat and barley genetic material with different versions of the heading-date gene (the gene that controls the length of time it takes for the crop to produce grain). Breeders can use these lines to breed varieties that have a wider range of heading dates and are more frost tolerant.

Contact: Dr Ben Trevaskis, CSIRO Plant Industry, no phone number listed, ben.trevaskis@csiro.au

Giving breeders faster access to international pools of genetic wheat material

Project number: CSP00076

January 2006 – June 2008

Australian wheat breeders now have faster access to international pools of genetic wheat material that is suitable for breeding new varieties to suit Australian conditions. These varieties will help Australian growers to remain sustainable and competitive in the face of climate change.

Contact: Dr Scott Chapman, CSIRO Plant Industries, (07) 3214 2255, scott.chapman@csiro.au

Maintaining wheat grain number and size during reproductive-stage drought stress

Project number: CSP00089

July 2006 – June 2009

The project offers breeders insights into drought tolerance in wheat. Breeders can use this knowledge, and the genetic plant material developed by the researchers, to develop wheat varieties with more stable yields under drought conditions.

Contact: Dr Rudy Dolferus, CSIRO Plant Industry, (02) 6246 5010, rudy.dolferus@csiro.au

Frost tolerance in pulse crops

Project number: DAS00066

January 2006 – June 2011

Researchers aim to identify frost-tolerant pulse crops by identifying genes known to be involved in frost tolerance and using them to produce frost-tolerant parent lines for Pulse Breeding Australia's breeding programs.

Contact: Dr Maqbool Ahmad, South Australian Research and Development Institute, (08) 8303 9483, ahmad.maqbool@saugov.sa.gov.au

Breeding for bacterial-blight resistance in field pea, pod-drop tolerance in lentil, and heat-stress tolerance in field pea and faba bean

Project number: DAS00067

January 2006 – June 2011

Researchers are developing genetic plant material for field pea, lentil and faba bean which is resistant to bacterial blight (field pea), and has pod-drop (lentil) and heat-stress (field pea and faba bean) tolerance. They will provide this material to the National Pulse Breeding Program and, through this program, growers will eventually have access to varieties of field pea, lentil and faba bean with these characteristics.

Contact: Dr Maqbool Ahmad, South Australian Research and Development Institute, (08) 8303 9483, ahmad.maqbool@saugov.sa.gov.au

Breeding for drought tolerance and disease resistance in chickpea

Project number: ICA00006

July 2007 – June 2010

Researchers are developing efficient and high-yielding chickpea cultivars with resistance to disease and environmental stress for growers in Mediterranean environments.

Contact: Dr Muhammad Imtiaz, International Centre for Agricultural Research in the Dry Areas (Syria), +963 21 221 3433, M.imtiaz@cgiar.org

Breeding for frost tolerance in barley

Project number: UA00063

July 2007 – June 2011

Researchers are validating the commercial significance of Japanese-derived frost-tolerant barley, and justify investment (by breeding organisations) in the development of new frost-tolerant varieties.

Contact: Assoc. Prof. Jason Eglinton, University of Adelaide, (08) 8303 6553, jason.eglinton@adelaide.edu.au

Early maturing barley for low-rainfall farming systems

Completed project

This project developed early maturing barley varieties, which show a yield advantage for regions with growing-season rainfall of less than 250 mm and typical yields less than 3 tonnes per hectare.

Contact: Assoc. Prof. Jason Eglinton, University of Adelaide, (08) 8303 6553, jason.eglinton@adelaide.edu.au

Adapting to climate change by changing practices

Using biofuels for energy efficiency, self sufficiency and production at farm to regional scale

Project number: CSA00012

June 2007 – May 2010

How well can the production of biofuels can be incorporated into current food production at farm, regional and national scales? The grains industry, including growers, will understand more about this as a result of this project, and will have more accurate data about possible energy savings and production costs related to growing biofuels.

Contact: Dr Deborah O'Connell, CSIRO Sustainable Ecosystems, (02) 6242 1573, Deborah.O'Connell@csiro.au

Developing cropping and mixed cropping/grazing businesses that are resilient to climate change

Project number: CSA00022

2009 – 2010

This project will create an integrated national framework of options that farmers, farmer groups and agricultural advisers in cropping and mixed cropping/grazing can use to understand their vulnerability to climate change and to choose adaptation strategies that will allow them to remain profitable and environmentally sustainable.

Contact: Dr Steven Crimp, CSIRO Sustainable Ecosystems, (02) 6242 1649, steven.crimp@csiro.au

Can we forecast seasonal wheat-grain yields and protein in Western Australia?

Project number: CSP00040

April 2003 – September 2007

Wheat growers in parts of Western Australia can increase their profits by considering seasonal forecasts as part of their management decisions, particularly decisions about nitrogen fertiliser, which accounts for about one-third of farm expenditure in Western Australia.

Contact: Dr Senthold Asseng, CSIRO Plant Industry, (08) 9333 6615, Senthold.Asseng@csiro.au

CropMate – climate information for crop production

Project number: DAN00102

January 2007 – December 2010

A new web-based tool called CropMate, which combines data on climate, seasonal forecasting, soils, crops and economics, will help farmers reduce risk and uncertainty in grain production.

Contact: Mr Chris Cole, DPI New South Wales, 02 6391 3144, chris.cole@dpi.nsw.gov.au

Adaptations for growing wheat in a drying climate

Project number: GRS127

January 2007 – March 2010

This project is investigating adaptations for growing wheat in a drying climate. It will provide a better understanding of the interactions between genetic factors and seeding technologies (such as variable row spacings) that have the potential to increase yields in drought seasons.

Contact: Dr David Bowran, GRDC, (08) 9690 2000, dbowran@agric.wa.gov.au