

# Victorian Climate Change Adaptation Program



## Newsletter # 3 May 2009

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### Introduction from the Project Leader

The Victorian Climate Change Adaptation Program is now entering the last 12 months of this current funding round. While we are planning future directions post June 2010, we are also focusing the team strongly on the next 12 months delivery of information and tools. Part of this delivery is the presentation of our work and information in newsletters, fact sheets, at workshops in south west Victoria and at State and National conferences and forums.

#### Greenhouse 2009 and Climate-21

The DPI VCCAP team made a strong representation at the recent national "Greenhouse 2009" and "Climate-21" conferences in Perth in March 2009, with members of the team involved in 8 papers and 2 posters:

- Geo-visualising climate change scenarios in south west Victoria. Chris Pettit, Jean-Philippe Aurambout and Falak Sheth
- Institutional values and adaptive capacity: a case study from north west Victoria. Patricia Fitzsimons

- A policy choice framework for assisting agricultural industries to adapt to climate change. Geoff Kaine, Jean Sandall and Fiona Johnson
- Spatial biophysical impacts of climate change on wheat production in south west Victoria. Brendan Christy, Garry O'Leary and Kurt Benke
- Modelling climate change impacts and adaptation options in south west Victorian pasture systems. Brendan Cullen, Ian Johnson and Richard Eckard
- The Challenge for Agriculture – Reducing Emissions while Feeding the World. Richard Eckard
- A whole farm system analysis of greenhouse gas emissions from simulated dairy farm systems in Australia. Karen Christie, Richard Rawnsley and Richard Eckard
- DPI Victoria's Victorian Climate Change Adaptation Program (DPI VCCAP). Richard Eckard
- Emissions and Abatement in Agricultural Systems. Richard Eckard

A paper was also presented by Karen Wales from the South West Climate Change Forum (SWCCF) on the challenge of primary producers changing with the climate.

#### Australia's first Adaptation Symposium

DPI VCCAP staff will also be presenting their research in both the Landscapes and Policy sessions at the "Working with climate change: an adaptation symposium" to be held in Melbourne on the 3rd and 4th June. The symposium is bringing together leaders and decision makers from government, business, academia and the community to jointly address the challenges and explore the opportunities of climate change. Please visit [www.climatechange.vic.gov.au](http://www.climatechange.vic.gov.au) for the symposium program and to register.

### New staff in DPI VCCAP

The departure of Traci Griffin from the VCCAP team left a large gap in a number of areas. We are therefore pleased to welcome Natalie Tostovrsnik, DPI Knoxfield, to take on the knowledge brokering, networking and communications roles. Natalie comes from a social science background and her skills will be a great asset to the team. Welcome Natalie.

Traci also assisted with overall project management and we welcome Mike Morris, DPI Tatura, who will be taking on this role. Mike has a long history in research and project management in DPI and is the Research Manager of a number of staff in DPI VCCAP. Welcome Mike.

Richard Eckard

Science Leader DPI VCCAP

DPI Victoria and the University of Melbourne

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## Choosing policy instruments to assist adaptation

*Jean Sandall, Fiona Johnson, Geoff Kaine and Ruth Lourey, DPI VCCAP Policy Research*

DPI VCCAP's policy research team has been working on a framework that will help policy makers to choose a package of policy instruments for assisting Victorian primary industries to adapt to climate change. This framework, the Policy Choice Framework, draws together recent developments in adoption, compliance, institutional and economic research. Work so far has highlighted the importance of Government investment into research aimed at identifying agricultural practices that will assist primary producers to adapt to climate change. Work so far has also highlighted a role for Government in ensuring the adoption of such practices among primary producers.

The policy research team is currently building on the progress that has already been made in forecasting the regional impacts of climate change and, therefore, the characteristics that agricultural practices will need to have to enable primary producers to adapt in specific regions. To this end, the team is applying the Policy Choice Framework to some practices aimed at enhancing the adaptive capacity of primary producers in the Goulburn Broken region in northern Victoria. In response to climate change projections, a range of on-farm

practices and off-farm policy options have been developed for assisting primary producers to adapt to climate change in this region. As on-farm practices and off-farm policy options are developed in other regions, such as the south west region of Victoria, the Policy Choice Framework could be applied to assist the choice of policy instruments for these regions.

Government may assist primary producers to deal with the additional challenges posed by climate change by investing in research into identifying on-farm practices that deal with the additional challenges posed by climate change. It may also assist primary producers by providing them with information and tools to evaluate the suitability of alternative on-farm practices. Because the suitability of on-farm practices is likely to be influenced by off-farm policy settings, such as the water licensing conditions, Government may also assist primary producers to deal with the challenges posed by climate change through its choice of policy instruments. The policy team will use the Policy Choice Framework to examine these issues in the Goulburn Broken region in the hope that this will provide insights into the nature of the challenges posed by climate change and the policy instruments that may assist primary producers to manage such challenges.



*Cattle and sheep grazing in the south west - from Karen Wales SWCCF*

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## e-Resource Centre – an innovative virtual collaboration space

*Linden Raybould, DPI VCCAP e-Resource Centre*

The e-Resource Centre (eRC) is an online resource providing the DPI VCCAP team and collaborators with the means to undertake research in a truly collaborative manner. Coordinating the large body of data, information and knowledge that the team and partners are producing can be a challenge that influences the effectiveness of operations and outputs.

The eRC workspace developed in collaboration with the Victorian e-Research Strategic Initiative (VeRSI) for DPI VCCAP, has recently been updated with a few changes made to the layout to improve navigation through the site and facilitate access to information within each theme. The new 'look and feel' home page is illustrated below and provides links to recently updated sites (What's New?), the calendar of events, RSS feeds and each VCCAP theme's customised workspace.



*New eRC design with customised VCCAP theme workspaces*

### User Guide and Instructional Videos

To further assist users and introduce them to the functionality and tools available within the eRC, a user guide and series of instructional videos have been prepared. These resources can be accessed from the eRC's User Guide page or by contacting the eRC administrator (Linden Raybould). The new extensive help resources provides information on:

- Logging-in
- Navigating the workspace
- Editing pages and adding content
- Creating and editing tables
- Adding a calendar entry

### Really Simple Syndication (RSS) Feeds

Many organisations and media groups utilise RSS Feeds as a means of distributing their latest news. Subscribing to RSS feeds allows you to see when your favourite websites add new content and with multiple feeds you can browse the latest headlines without having to visit each specific website to keep abreast of news.

An RSS page has been added to the eRC and can be accessed from a link on the homepage or via the navigation directory. The RSS page lists the top five feeds for each subscription and displays climate related headlines from a range of sources including:

- The Australian (Climate)
- UNFCCC (Climate Change Headlines)
- CSIRO (Media Centre)
- Pew Centre on Global Climate Change
- New Scientist (Climate Change)
- Climate Change Australia Podcast

If you would like to add a feed to this page, please contact the eRC administrator.

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## Climate change and land use dynamics

*Victor Sposito, DPI VCCAP Land Suitability Analysis*

A decision-making framework was developed and is being applied in the south west region to identify land use changes and adaptation issues arising in agricultural systems (including forestry) as a consequence of climate change. Agriculture is very susceptible to the adverse impacts of climate change with major shifts in temperature and rainfall projected across Victoria.

The framework combines three models. Its departing module is the climate change projections which are derived from the IPCC emissions scenarios scaled down to the regional level.

The first model integrates multi-criteria evaluation (MCE) and GIS to map the degree of land suitability for the growth of those agriculture commodities relevant to the region, given current and future climate conditions. The crops assessed belong to three groups: grains (wheat, barley and oats), pasture (ryegrass/sub-clover, lucerne and phalaris) and forestry (blue gum and radiata pine). Likely modifications in agriculture land suitability caused by climate change can be analysed by comparing future suitability maps (scenarios) with current suitability maps.

The second model estimates the uncertainties related to the first model. The third model uses optimization algorithms to identify (sub-)optimal spatial distributions of cropping systems for the entire region based on one factor, or any combination of several factors, including land suitability, crop productivity (yields), market demand/price, revenue, environmental damage, or transport costs.

Outputs of the chain of models can then be fed into the analysis of adaptation options. The feedback loops in the figure depict the iterative nature of the decision-making process. The framework allows the investigation of 'what if' policy questions by, for example, modelling crops that may be suitable in a wide range of plausible futures and examining the consequences of cultivating them.

The modelling framework provides a robust approach to (i) recognize regions under threat of productivity declines, (ii) identify alternative cropping systems better adapted to likely future climatic conditions and (iii) investigate actions to improve the sub-optimal situations created by climate change. The research thus provides a methodology and a suite of tools to aid in the formulation of sustainable regional development and adaptation strategies to build upon opportunities and lessen the negative impacts of climate change.

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## Institutional adaptation

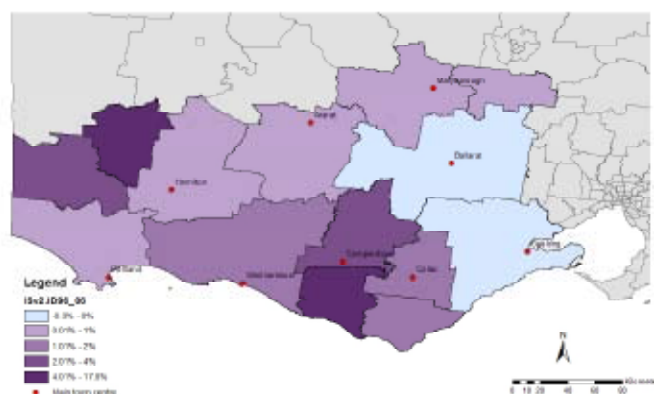
*Patricia Fitzsimons, DPI VCCAP Institutional Adaptation*

Institutional adaptation is not a concept many people are familiar with so it is important to clarify the use of the term. Institutions are sets of rules and decision-making processes. People abide by a number of rules which are based on the values of the institution as well as personal values. A focus on institutions highlights people's willingness to adapt, the quality of social relations and how their understanding of climate change influences adaptation and mitigation responses.

Our regional economist, Esther Liu, has prepared a regional economic profile of south west Victoria. The profile develops a series of indicators that highlight key drivers of change. The indicators include:

- Industry structure – based on employing industries and includes industry specialisation and diversification (refer to the industrial diversity map below).
- Farm economic performance – includes profitability, level of debt, off-farm income.
- Agricultural commodities produced – highlights key products, trends and price movements and the value and volume of production.

Change in industrial diversity for labour market regions in SW Victoria 2006



A literature review is currently underway to profile a series of economic models capable of investigating the flow of commodities from producers to consumers. It is intended to utilise the scenarios produced by Leon Soste into the models to highlight the impacts of climate change on industry profitability.

A new staff member Sophie Webber is working in the area of adaptive capacity. Adaptive capacity is broadly defined as the ability of a system (region and community) to cope and thrive in the face of change. A series of indicators of adaptive capacity have been identified and the data is being placed in



the National Data Grid (NDG), a data platform that adopts a grid cell-based approach to managing spatial information. The NDG supports simple spatial queries, including time-series analysis and the capability to weight indicators, which enables communities to determine policy and investment priorities.

An engagement process will be undertaken to identify key components of adaptation. The process will be trialled with the South West Climate Change Forum in June with the aim of undertaking a number of engagement processes with industry groups over the next year.

A presentation was made at Greenhouse 2009 on the role of values in decision making. The paper developed a methodology that considers the role of different value systems in limiting adaptation to climate change and highlights practices associated with the different value systems.

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## Scenarios for agriculture in the south west

*Leon Soste, DPI VCCAP Scenario Development*

Agriculture is a complex system involving production, processing, transport, regional communities and global markets. That system is facing significant change. Climate, trade agreements, consumer preferences and input costs are all evolving, with changes being largely out of our control. The question becomes: How do we plan for the future of agriculture in an environment of considerable uncertainty?

To help answer this question, the scenario theme within DPI VCCAP aims to use the experience of on-ground stakeholders in regional industry, agencies and policy to:

- Develop 3-4 different and challenging scenarios of how the future for agriculture and communities in south west Victoria might unfold to 2050 and beyond,
- Explore the likely impacts of these scenarios for business, communities and the environment,
- Identify the likely adaptive response strategies of regional stakeholders,
- Use that information to provide guidance to policy groups (both State and regional), regional industries, agencies and communities on – What actions can they take in order to help Victorian agriculture and regional communities respond adaptively to an uncertain future?

The research plan for the scenario theme has been externally reviewed to ensure that it is consistent with world's best practice. It is being progressed in the following stages:

### Stage 1 Scenario formulation

Scenarios have been developed around climate projections from the Intergovernmental Panel on Climate Change (IPCC), and non-climate drivers such as the global economy, market access, energy and consumer preferences. Relevant regional drivers such as competition for land were also included.

The scenarios and their underlying rationale have been widely circulated to ensure plausibility and internal consistency.

### Stage 2 Scenario analysis

A group of about 20 experienced stakeholders from regional industries and agencies has recently commenced using their knowledge and experience to provide a holistic assessment of likely scenario impacts and adaptive responses. The group will be assisted by input from the biophysical, social research and visualisation themes.

### Stage 3 Policy and adaptive response options

The information from stages 1 and 2 will be used to provide guidance to policy groups, industries and communities on – What policies and actions are needed in order to help Victorian agriculture and communities respond adaptively to climate and other change.

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## New DPI Future Farming Strategy Climate project underway

*Graeme Anderson, Senior Subject Specialist - Climate Change, DPI Farm Services Victoria*

The Victorian Future Farming Strategy has kick-started a new practice change project and team to help Victorian farm businesses and service providers prepare for the climate and emissions challenge.

The program provides a key boost to DPI Farm Services Victoria provision of climate change expertise across the state and includes key staff within grains, dairy, meat & wool and horticulture teams. The group will be valuable in providing a key cross-sector route to market for emerging climate change and emissions research, policy and practice change information.

The new team have hit the ground running - having delivered over 100 presentations since June to over 2000 participants on topics such as climate change, emissions trading and agriculture, carbon trading and climate/seasonal risk. Participants have included farmers, industry representatives and service providers in the grains, dairy, livestock and horticulture sectors. There has been 18 events which have also been targeted within DPI where 600 staff have been provided with key updates on the latest climate and emissions information for Victoria – so they can build key knowledge into their own programs and services.

The focus for 2009 will include regional policy engagement forums, expansion of “The Break” climate & seasonal risk newsletter, development of a case study series of positive and practical action, adoption of carbon tools, increasing understanding of emissions management and developing capabilities of public and private service providers within Victoria’s agriculture industries.



*Farmers Lance Huebner and David Boschen with De-Anne Price, DPI Horsham at the Wimmera Machinery Farming Field Days*

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## Visualising Climate Change Futures

*Chris Pettit, Jean-Philippe Aurbout and Falak Sheth, DPI VCCAP Visualisation*

The DPI VCCAP visualising team, is currently working on the development of:

- Visualisation approaches to better communicate Scenario storylines being developed by the Scenario VCCAP team.

- A realistic three-dimensional virtual representation of DemoDAIRY (a farm, in south west Victoria), with the aim of visualising climate change impact on the agriculture industry at the local scale.
- A methodology to evaluate the usability of various visualisation products and their effectiveness to communicate climate change outcomes to end users.

DemoDAIRY is a 166 ha non-for-profit commercial dairy farm and research facility located in south west Victoria. It is divided into over 50 experimental paddocks of 2.5-3 hectares.

The considered production system is complex and encompasses multiple variables, such as animal stocking rates, crop type and crop phenological stage. It cannot be easily described and communicated through traditional table, graph or map interfaces. To address these challenges, we made use of 3D realistic landscape visualisation software: 3DNature Visual Nature Studio, Autodesk 3DS Max and the Spatial information exploration and visualisation environment (SIEVE) gaming environment.

The first phase of our two step project is to develop, with the help of various visualising tools, a virtual prototype of the DemoDAIRY site displaying current production conditions. The second phase will aim at communicating how these local conditions could change as a result of the projected climate change for south west Victoria.

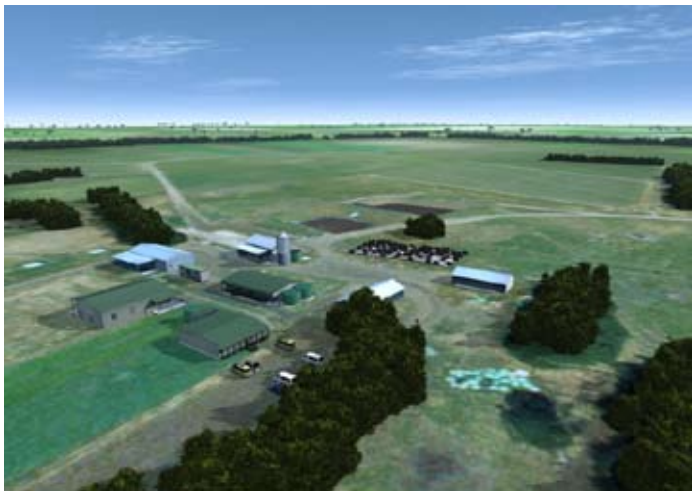
The project started with a visit of DemoDAIRY to collect the following datasets: farm plan, aerial imagery, digital elevation model, information on the types of crops being grown and animals being raised, and photos of vegetation, animal and structures present at the site.

A non interactive representation of the real farm was developed in 3DS Max and Visual Nature Studio (illustrated in the following figures) and an interactive version is under development in the SIEVE collaborative gaming environment, developed by the University of Melbourne.

Visualisation in 3D is an appealing way of communicating data, but its capacity for allowing people to retain information effectively, compared with more conventional data communication methods, still needs to be quantified. The various visualisation products developed for DemoDAIRY will provide the base for our visualisation evaluation project. This project aims to answer questions such as (i) under what circumstances specific visualisation technique should be used, (ii) what type of tool is most suitable for which end user or (iii) which tool or combination of tools allow for more effective communication.



*Representation of an existing paddock in the virtual DemoDairy farm*



*Existing building structures in the virtual DemoDAIRY farm*

The concept of conveying Victorian climate change findings to end users through 3D visualisation was presented at the Greenhouse 2009 conference. The presentation was well received and Dr Pettit was invited to present the team's work both to the Department of Agriculture Forestry and Fisheries and to the Bureau of Meteorology.

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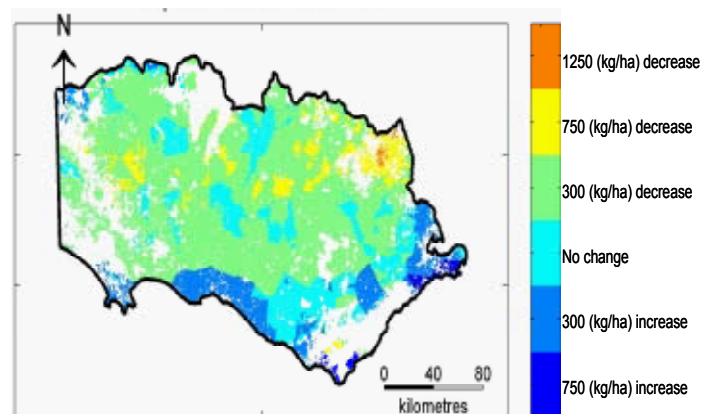
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## Agricultural biophysical response to climate change in south west Victoria

*Garry O'Leary, Brendan Christy and Anna Weeks, DPI VCCAP Impact Modelling*

DPI VCCAP is using biophysical models to determine the likely response of the four key agricultural enterprises in south west Victoria to climate change. The agricultural enterprises being tested are: dairy, grazing, high-rainfall cropping and farm forestry. The Catchment Analysis Tool (CAT) has incorporated the climate change projections from CSIRO for regional Australia as it allows the consideration of both landscape and seasonal response for all enterprises being considered. The ability of CAT to integrate multiple land uses into a connected landscape allows this project to explore how catchment landscape resources like groundwater and stream flow will respond to climate change.

The modelling being undertaken firstly considers how climate change affects future productivity. These productivity results show a range of impacts (both positive and negative) for different locations within south west Victoria. This is illustrated by the example given, which shows wheat yields of present day cultivars are expected to decrease over the whole region by about 3%, but yield increases of around 10% is expected in the southern parts of the region. This is in contrast to yield decreases of the order of 25% from the Wimmera and Mallee regions from earlier studies. The crop models used have been validated against the Australian Grains Free Air Carbon dioxide Enrichment (AGFACE) experiment in Horsham, Victoria.



*Mean wheat yield (cv Chara) response due to climate change*

Once the impact of climate change on productivity is determined, the models are then used to explore how the agricultural enterprises can change to adapt better to future climate stresses. For the cropping data shown above, the modelling has explored how changing practices (eg. sowing time) and/or cultivars, can overcome the predicted yield losses, both in south west Victoria and the Wimmera and Mallee.

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## South West Climate Change Forum

*Karen Wales, SW CCF Project Manager*

The South West Climate Change Forum (SWCCF) has continued to receive support from agencies in the south west to undertake projects and expand knowledge on climate change. Corangamite and Glenelg Hopkins Catchment Management Authorities, South West Primary Care Partnership and DPI AgFutures have all invested in the "Lessons from the Landscape Project" since October 2008. This project uses photography to engage students and community members in small towns in thinking about and showing "What climate change means to me." Fifty disposable (recycled) cameras were circulated through the local schools and townships for 2-3 weeks. The films were processed and following a local selection panel, the photos exhibited were based on messages being portrayed and photographic merit.

The photos were exhibited in the area to coincide with a community event and guest speaker on aspects of climate change. The towns involved in the project so far include Hawkesdale, Noorat, Deans Marsh and Winchelsea. Results from the surveys show that the project raised awareness of the possible effects of climate change and alerted both participants and exhibition viewers to other aspects they had previously not considered.

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*Thomas Jennings, Y6 Winchelsea Primary School depicting his concern about climate change on the empty lakes in south west Victoria*

SWCCF is awaiting news of funding through DAFF FarmReady and hopes to continue to roll out this project into more towns in the region and continuing to engage those towns who have already participated.

Karen Wales, Project Manager, SWCCF also attended the Climate 21 Conference in Perth, run by the Department of Agriculture WA, in March to showcase the unique network and activities of the Forum in communicating climate change issues to primary producers.

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