DEPARTMENT OF
PRIMARY INDUSTRIES

Victorian Climate Change Adaptation Program

Research Theme

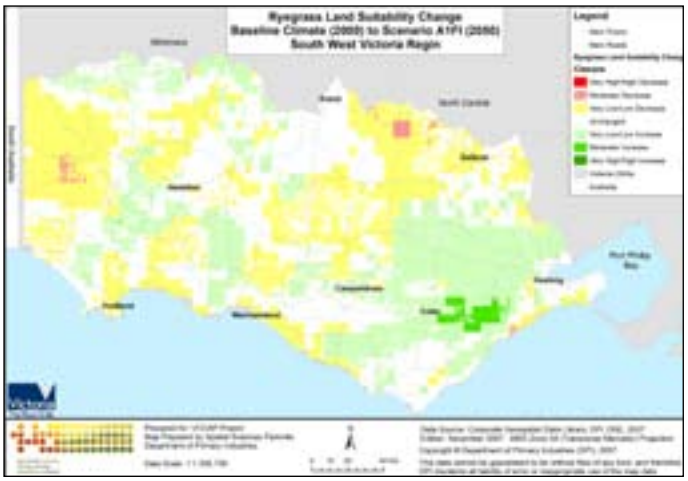
Impact Modelling and Land Suitability Analysis

Understanding the likely impacts of climate change on current and future agricultural production systems is essential to guide sustained action to develop farming systems that persist and evolve in a changing climate. In particular, biophysical modelling of crop, pasture and forestry production systems is crucial for exploring elements of weakness and resilience in the biophysics of production systems.

Impact modelling – Models deployed allow investigation of climate change biophysical impacts on agricultural and forestry systems, including impacts on natural resources (land, water) and the environment (atmosphere, biodiversity, sea level).

Land Suitability Analysis (LSA), Uncertainty Analysis (UA) and Land-use Optimization (LUO) – Three loosely-coupled models. The first, LSA, integrates a multiple-criteria evaluation (MCE) method in a GIS to map the land suitability for commodities, given current and future climate. The second model estimates the uncertainties related to LSA. The third model uses a "Genetic Algorithm" to allocate/optimise agricultural land use based on suitability and economic factors.

Agriculture Production Models – These complement the previous models to examine impacts on productivity, particularly in specific locations, including APSIM and CROPSYST for grains and CAT for landscape responses.



Ryegrass Land Suitability Change: comparison baseline (Year 2000) and future (Year 2050) extreme scenario (A1FI)

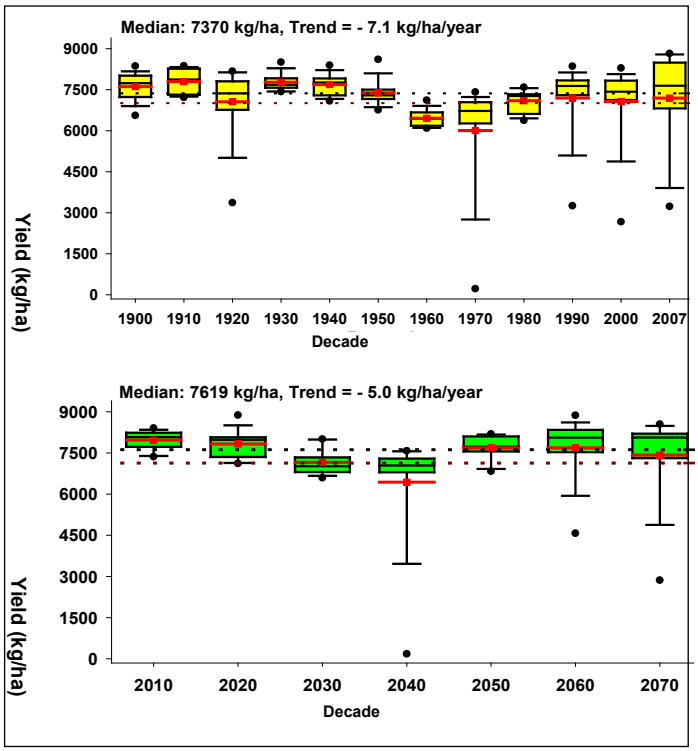
Achievements

- Formulation of a holistic methodology for examining climate change impacts in regions and industries, including a Risk Assessment/ Management Framework
- Climate change regional monthly projections for key climatic variables (temperature; rainfall; solar radiation) in three IPCC Marker Scenarios (B1/Low GW; A2/Mid-range GW, and A1FI/High GW) for the south-west pilot region, and location-specific projections for daily values of the same climatic variables in six places, including Hamilton
- Development and application of eight LSA models for the key current agriculture/forestry commodities in the pilot region including: Grains (Wheat, Barley and Oats); Pastures (Ryegrass/

sub-clover, Phalaris, and Lucerne), and Plantation Forestry (Pinus Radiata and Blue Gum)

- A methodology for UA in MCE methods, and application to estimate the uncertainty in the LSA models applied in the pilot region

- Impacts of climate change on productivity (with and without CO_2) in wheat and pasture (Ryegrass/ Sub-clover and Phalaris) at Hamilton.



(a) Historical wheat yield (a) and (b) projected A1FI climate change scenario expectation, at Hamilton. The figure depicts grain yield per decade as mean (red line), median (black line inside box), 25 and 75 percentile (lower and upper box), 5 and 95 percentile (lower and upper ticks) and low and high extremes (dots). The dotted lines show the overall mean (brown) and median (black).

Next Steps

- Based on the holistic scenarios developed in the DPI VCCAP Farming Systems Scenario Development project, an investigation of the performance of the systems with the introduction of new agricultural activities

- Further investigation of climate change impacts on surface and groundwater systems, and feedback loops to current/future agricultural activities and natural resources

- Research and application of advanced agricultural land use/activities models, incorporating economic considerations

- Analysis of biophysical adaptation responses to the challenge of climate change at state-wide/ regional levels and industry sectors.

Futher Information

DPI VCCAP website: www.dpi.vic.gov.au/vro/vccap

Victor Sposito, DPI Parkville
Unit Leader, Strategic Resource Planning
Tel: (61) 3 8341 2400
Email: Victor.Sposito@dpi.vic.gov.au

Garry O'Leary, DPI Horsham
Senior Research Scientist,
System Modelling
Tel: (61) 3 5362 2111
Email: Garry.O'Leary@dpi.vic.gov.au

If you would like to receive this information/publication in an accessible format (such as large print or audio) please call the Customer Service Centre on 136 186; TTY: 1800122 969, or email customer.service@dpi.vic.gov.au.

Published by: Department of Primary Industries
1 Spring Street, Melbourne, Victoria, Australia. July 2008

© The State of Victoria, 2008

This publication is copyright. No part may be reproduced by any process except in accordance with the provisions of the *Copyright Act 1968*.

ISBN 978-1-7417-077-0 (print)
ISBN 978-1-7417-078-7 (PDF)

Authorised by: Victorian Government 1 Spring Street,
Melbourne, Victoria 3000 Australia

Disclaimer
This publication may be of assistance to you but the State of Victoria and its employees do not guarantee that the publication is without flaw of any kind or is wholly appropriate for your particular purposes and therefore disclaims all liability for any error, loss or other consequence which may arise from you relying on any information in this publication.

For more information about DPI visit the website at www.dpi.vic.gov.au or call the Customer Service Centre on 136 186.