CliMag

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Climate Connect 2006

Those who attended the recent forum of the Managing Climate Variability (MCV) program, Climate Connect 2006, agree that it was an informative and lively two-day event. Dr Roger Stone of Queensland's Department of Primary Industries and Fisheries attributed its success to having 'exactly the right mix of people and content'.

Dr Jim Buizer, Arizona State University, delivering the keynote speech at Climate Connect 2006

The 120 attendees included representatives of the program's investors, some of Australia's top climate scientists, meteorologists, researchers, government policy makers, agronomists, extension officers, farmers and natural resource managers.

As well as providing updates on the latest MCV research, attendees received an overview of the MCV program and the projects that it funds. The key benefits were seen to be in making contacts and networking. 'Please continue to work to maintain the networks, the collaboration and the communication', said Dr Ian Watson from Western Australia's Department of Agriculture and Food.

Day one focussed on the history of climate forecasting, revealing the revolution in climate science that has occurred in the last 30 years. A number of researchers spoke about the difficulties of communicating climate forecasts (see Page 7 for communication tips).

Day two was dedicated to the 24 MCV-funded projects and three projects funded through the Grains R&D Corporation. Lively debate concluded each session. 'The forum opened a lot of new doors to information I knew about but wanted explained plainly', said Dr John Leys, a researcher with the Department of Natural Resources, New South Wales.

Consultants and farmers expressed interest in exploring further the capabilities of seasonal climate forecast tools including Yield Prophet (now available via the web), SILO (now including wind data), Whopper Cropper and Rainman. The possibilities of global circulation models for improved forecasting, particularly in the context of climate change, and the implications of decreasing evaporation (see story on Page 3) were also of great interest.

The Managing Climate Variability team wishes to thank everyone who attended, contributed to the forum and provided constructive feedback.

To download project fact sheets or request a CD-ROM of forum proceedings, including presentations, visit http://www.managingclimate.gov.au

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MANAGING CLIMATE VARIABILITY R & D PROGRAM

Working with the weather
on land and on water

In this edition, we welcome Colin Creighton to the Managing Climate Variability (MCV) team. Colin succeeds Dr Rohan Nelson in the role of Program Coordinator.

Originally from the Lower Clarence, Colin is now based in the Eungella Tablelands west of Mackay, Queensland. 'Eungella means "in the clouds"', says Colin, 'which is not surprising given the annual rainfall varies between two and six metres and we're 1000 metres above sea level. Here, you still need a blanket on the bed in summer'.

Colin and his partner Lorelle manage 200 hectares of mostly rainforest, with 10 hectares of plantation forestry, dairy cows and heifers on agistment, and an acre of elephant garlic.

But his passion is the ocean. 'In a way, sailing is like farming', says Colin. 'The skill in sailing is in working with the weather and real-time forecasting.'

Residing in Mackay is not all sailing, of course. Colin is the Executive Officer of the Mackay Whitsunday Natural Resource Management Group, a position he juggles with his new MCV role.

'As part of MCV, I see myself as the conduit between science and action. My job is about having that vision, building the networks, and enabling and supporting others.

'A large part of the job is defining, with all the partners, the next phase of the program and I am already looking at what science is required. The next phase is where I see I can make a difference. There are three key parts:

1) Increasing the certainty of seasonal climate forecasts to improve profitability of land managers and outcomes for natural resource managers

2) Making the right tools and information available; science alone doesn't make a difference; we should be asking, what if we could...if only we knew...

3) Broadening the applicability of the science. We can use the science to predict how much water might reach our dams and irrigation systems. If we can expect more severe floods and droughts, how can we manage for these extreme events? Cyclone Larry wiped out the lychee and macadamia crops but the mangoes survived. So we can manage risk by knowing what crops to plant, not just how much water they need.'

Colin comes to MCV having led the CSIRO National Research Flagship on water for almost three years. Under his direction, efficiencies made in Perth's water supply system saved millions of dollars. Developing water budgets for the Murrumbidgee has helped to locate surplus water and areas for investment. The system is now being rolled out across the Murray region. Colin also led the bioregionalisation initiative of the National Oceans Office.

Prior to this, he worked for Land & Water Australia on both the Rivers and Irrigation research and development initiatives. He is proud to have led the first ever comprehensive audit of Australia's natural resources, as Executive Director of the first phase of the National Land and Water Resources Audit.

Colin has two children, Naomi and Reuben, both students at the University of Canberra.

Meet The MCV team

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Drier or wetter?

It's not all about rainfall

When it comes to climate change, the question on everyone's lips is: Is it getting wetter or drier?

Before we can answer that question, we must understand the natural balance of supply and demand. Like a bank account, we get rainfall in and we lose water through evaporation. So, measuring rainfall alone is not enough—we need to measure evaporation as well.

Scientists have already measured all the rain that has fallen on the entire land surface of the planet for the last 100 years. Surprisingly for many people, it is more or less constant. Yes, some places are wetter and others are drier—and this changes from year to year—but there is more or less the same amount of rain falling on the entire land surface. It is just falling in different places.

A standard Class A Bureau of Meteorology evaporation pan

If our incomings are constant, what about our outgoings? Dr Michael Roderick and Prof Graham Farquhar of the CRC for Greenhouse Accounting went in search of an answer.

Evaporative demand is routinely measured using evaporation pans, and, in Australia and many other parts of the world, they found that average evaporation from these pans has been steadily declining. 'Some farmers who check their evaporation pans already know this and scientists are catching up with farmers', says Dr Roderick.

Analysing records going back to 1975 for 66 evaporation pans around Australia, they found that most of the change in pan evaporation was happening in summer and least was happening in winter—not too surprising.

They then separated out how much of the trend in decreasing evaporation was attributed to radiation (sunlight), air temperature, vapour pressure deficit (the dryness of the air) and wind speed.

The answer was surprising—wind speed had declined and this had caused most of the decrease in pan evaporation. And so, despite warming, over the past 30 years our climate has, on average, become 'effectively' wetter, not drier.

Dr Roderick stresses, however, that there are places, such as south-west Australia and parts of South Australia, that have got drier. 'The devil is in the detail', he says, 'because "on average" does not refer to any specific place'.

Why the wind speed is reducing in Australia is a fascinating question that awaits further research.

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Less frosty
for northern wheat growers

Studies in the northern wheat belt of Australia show that the climate is changing, with one indication being a significant decrease in frosts.

'This impacts the way farmers need to plan their cropping', said Dr Holger Meinke, researcher with the Queensland Department of Primary Industries and Fisheries.

Dr Meinke and colleagues from the Queensland Department of Natural Resources, Mines and Water, New South Wales Department of Primary Industries (Agriculture) and CSIRO looked at climate change and its current and likely effects on growers, especially in southern and central Queensland.

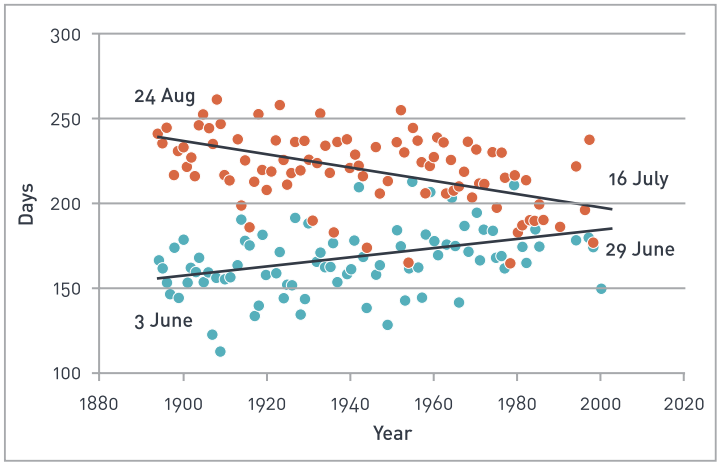
'Although many farm managers factor forecasts based on the El Niño – Southern Oscillation into their overall risk management approach, not much work has been done that looks at the likely impact of climate change on crop production', says Dr Meinke.

'The sustainability of the entire rural sector could be at stake unless we incorporate our knowledge of climate trends as well as climate variability into on-farm risk management.

'The first thing to realise is that climate change isn't about to start in 10 to 20 years time—it has been happening for some time and will be here for some time.'

Dr Meinke's work shows that farmers have been unconsciously adapting to climate change.

First and last days of frost at Emerald



'Producers and policy makers are to some extent "self-adapting"', he says. 'They modify their behaviours based on their most recent experiences. The problem is that this adaptation is haphazard and may take some considerable time.'

Dr Meinke led an MCV project that looked at historic trends in temperature extremes, frost and rainfall, and the likely risks to farmers and policy makers from the changes.

'For farmers, if they want to be profitable, they need to be aware of the risk factors, be they frost, high temperatures or changes in rainfall patterns', Dr Meinke says. 'Agricultural systems can accommodate a fair degree of variability, but if farmers are working in an already marginal situation, then a little bit of change can make a big difference to their viability.

'Policy makers need the best information to make decisions, especially about issues such as water allocation and how to use the available water in the most efficient manner.

'People need a sound understanding of the likely trajectory that we're headed in', Dr Meinke says. 'It's not about giving exact predictions, but about using science to look at the various scenarios and the management options that exist within each one.

'What will be important is to negotiate the tension between adaptation and mitigation. People who are concerned about adaptation have a different timeframe to those who want to mitigate the effects of climate change. But both are equally important to consider.

'And we often forget that climate change is not an evil, per se. It is a process that has downsides, but also opportunities—like less frosts in northern areas—and we need to look for ways to reduce the risks but capitalise on the opportunities.'

Dr Meinke's team has been proactively engaged with policy makers and rural industry groups and has contributed to a Queensland Government discussion paper on climate change issues, entitled Climate Smart Adaptation available at <http://www.nrm.qld.gov.au/science/climate.html>.

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Long-term records build confidence in management decisions

By John Ive

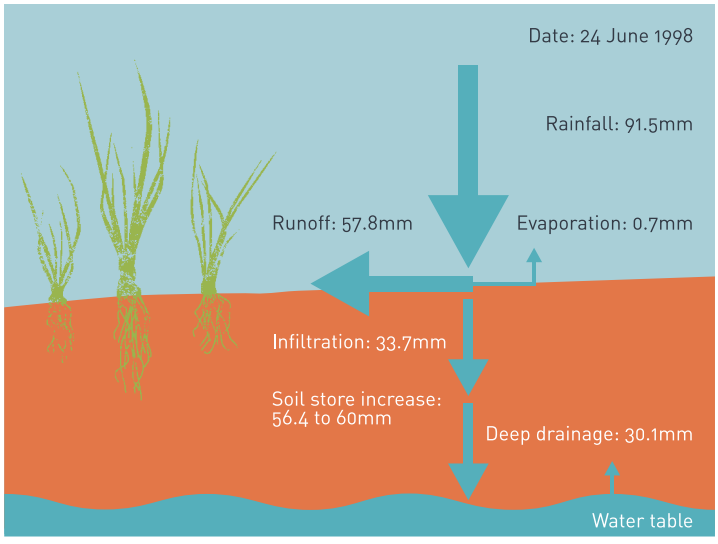
I've been a landholder for more than 25 years in an area attracting newspaper headlines such as 'Yass Dryland Salinity Capital of New South Wales'. My family has been committed to reducing the effect of dryland salinity on our production goals, and, over the past 15 years, our records indicate that we have lowered the water table by as much as six metres in some areas of our property, Talaheni.

John Ive's daughter, Carolynn, at Talaheni

We achieved this with a number of integrated approaches, including re-establishing trees on identified high recharge areas that have low production potential.

I'm often asked if this significant lowering of saline water tables is due to a period of below average rainfall—a fair question in light of recent below average rainfall patterns, particularly since the end of 2000, and a question I didn't have an immediate answer for.

Water balance model



John's daily water balance model partitioning a rainfall event that resulted in the fourth largest deep drainage event in 116 years.

I had previously developed a daily water balance model to help me understand the biggest determinant of our annual production at Talaheni—rainfall. The model partitions each rainfall event into runoff and infiltration. Infiltration in excess of the soil's capacity to store moisture within the rooting depth of vegetation passes below this depth to become deep drainage—the necessary catalyst for dryland salinity.

The primary inputs for the model are daily rainfall and evaporation. We record the rainfall daily at Talaheni and we take evaporation readings from the nearby Canberra meteorological site, available online at <http://www.bom.gov.au/climate/dwo/IDCJDW0100.shtml>.

To put our own deep drainage statistics in historical perspective, we turned to long-term weather records for the Yass area. We used our model to analyse local weather data going back 116 years, which we sourced on the Bureau of Meteorology's SILO website <http://www.bom.gov.au/silo/>.

What we found was that, while the 1920s and 1950s are the standout decades, the late 1980s and 1990s also had relatively high deep drainage. So, we had found an answer. Not only had we significantly lowered the water table, we had done so during a period of above average deep drainage.

Current predictions under climate change are that rainfall will decline in the Yass area, with individual rainfall events becoming less frequent but higher and more intense. Deep drainage is unlikely to increase under this scenario so we will 'keep doing what we're doing'. We take heart from the old records which have given us a historical context and confidence in our management decisions to date.

John and his family produce ultrafine Merino wool, Sharlea wethers and Angus beef cattle on their 250 ha property, Talaheni, Dicks Creek, New South Wales.

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Prophecies
for a risky business

Growing grain is a risky business and climate change is making decision making even more challenging, according to Dr Harm van Rees, consultant with the Birchip Cropping Group based in the Wimmera-Mallee region of Victoria and South Australia.

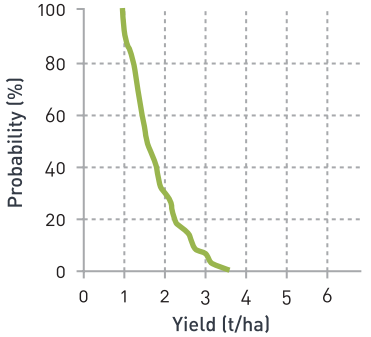
'With climate change, it is likely that summers will become 15 per cent wetter while springs are likely to become 10 per cent drier', says Dr van Rees. 'This means farmers need to change the way they plan their crop rotations.'

Most input costs for wheat, barley or sorghum are incurred upfront at seeding—exactly the time of the year when seasonal forecasts are not as accurate or as timely as they could be.

'We need to develop new cropping practices that are more flexible and allow farmers to be more opportunistic as the season progresses', Dr van Rees says. 'Farmers need information that can help them change crop inputs or manipulate their crops differently.'

The Birchip Cropping Group provides farmers with a commercial service that aims to take some of the guess work out of cropping. Their key tool is Yield Prophet, a web-based tool for simulating crop growth. Built on the APSIM (Agricultural Production Systems Simulator) model, Yield Prophet combines SOI data and historical data specific to the region with information on crop condition and seasonal outlook to predict:

- yield
- grain protein
- currently available water and water stress
- currently available nitrogen and nitrogen stress



Estimated yield (t/ha)

1:5 years	average	1:5 wet years
1.2	1.5	2.2

The APSIM simulation is using current conditions and then working out the probability of a yield based on 100 years of local rainfall. The model is estimating that in 50% of years a yield of 1.5 t/ha will be achieved.

NOTE: this crop is starting to suffer from moisture stress due to the high level of subsoil constraints. Crops on a better soil type grown in the same conditions have a yield estimate (at 50%) of 2.5t/ha.

Extract from Yield Prophecy (monthly fax to members of Birchip Cropping Group) showing crop yield estimates based on Yield Prophet

Harm van Rees demonstrating the impact of nitrogen fertiliser applied to wheat at the Birchip Cropping Group field day

'You can create unlimited scenarios with Yield Prophet', says Dr van Rees. 'This helps farmers to determine the impact on their crops from decisions such as crop type and variety selection, sowing date, nitrogen application date and rate, and irrigation date and rate.'

Yield Prophet has been available commercially to farmers for more than three years. In 2005, there were 338 paddocks subscribed to the service, involving 236 growers, 38 consultants, eight government extension and research officers and eight grower groups.

'We've had no-one drop out yet', says Dr van Rees. 'There are a lot of farmers who use the service extensively right throughout their cropping rotations. They can even use it for marketing before harvesting.

'In some years you get a huge value added from using the model. In July 2004, we advised that, due to conditions, farmers were likely to struggle to get a crop. Many farmers then reduced inputs such as fertiliser, saving thousands of dollars. It's about maximising gains in good years and minimising losses in bad years.'

The Agricultural Production Systems Research Unit (APSRU), which developed APSIM, has supported the Birchip Cropping Group and the development and application of Yield Prophet.

'But we need to stand alone and develop a viable business within three years to break even', Dr van Rees says. 'While we're an organisation run by farmers for farmers, we still don't want to make a loss.'

The prospects look promising with interest from farmers in South Australia and Western Australia.

For more information on Yield Prophet, visit http://www.yieldprophet.com.au

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Communicating
climate risk information

It was heartening to hear at Climate Connect 2006 how a number of the MCV projects are engaging farmers and natural resource managers at the outset of the project, not just as a final task.

Many presenters, however, talked about the challenge that communication poses, particularly in relation to the probabilistic nature of seasonal climate forecasts.

Why do we need probability?

We deal with uncertainty all the time. We buy shares, we get married, we plant crops, we buy cattle, and we make important policy decisions that affect people's lives.

Perhaps we are not used to hearing about uncertainty from science. Probability in climate science is important for two reasons:

1. It is honest to be clear about the uncertainty in the science.
2. Probabilities encourage us to manage risk. If properly understood, farmers and natural resource managers can incorporate probabilistic climate forecasts into their risk management.

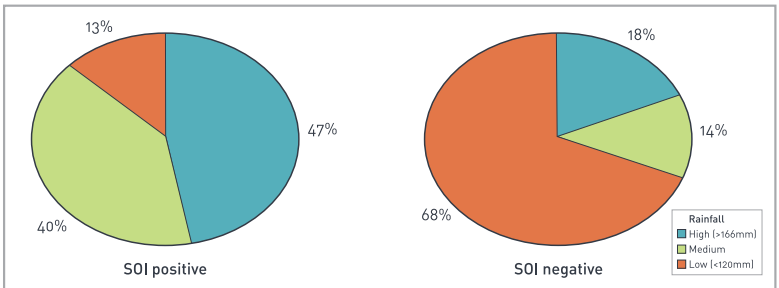
Probability refers in part to our knowledge and in part to our ignorance – French mathematician Laplace, 1812

Probability is more than mathematics; it expresses our belief in, and acceptance of, a range of alternative outcomes.

Communicating probability is hard

Farmers want to know whether it is likely to be dry, wet or average, not whether there is a 60 per cent chance of getting 40 per cent of the average rainfall.

Journalists like clear, direct information. A projection of increased probability of dry can become the headline 'Worst Drought Ever'.



Chance of rainfall

Analysis of historical data (1884 to 2005) using SOI Phases: Jun to Jul, Lead time of 0 months, Rainfall period: Aug to Oct.

A clear and simple way of representing the historical relationship between SOI phases and rainfall (Source: Rainman Streamflow)

10 tips for communicating climate risk information

1. Present the climate scientist as someone who can work with farmers in managing risk, not a clairvoyant who can see into the future.
2. Maintain the emphasis on risk rather than false certainty—and stick to this line. Seasonal forecasts will have a certain amount of skill or accuracy, but there is always uncertainty.
3. Be clear about the uncertainty. Don't obscure it with jargon or gobbledegook. Where you must use jargon, explain it in plain language or add a glossary.
4. Try using frequency to explain probability e.g. about six or seven seasons out of 10 are expected to be...
5. Use the language of your audience when targeting information to the different rural industries.
6. Link seasonal climate risk management tools to agronomy. Otherwise, farmers' interest will drop off.
7. Use clear and simple graphics to illustrate your point.
8. Make the media aware of your project early, potentially avoiding misunderstandings when the results are finally available.
9. Make it easy for the media to get the story right by designing and testing out clear messages that are rehearsed and explained simply and directly.
10. Remember that communication is about people and requires trust. This was a consistent finding from graziers interviewed by Peat Leith.

Thanks to Dr Peter Hayman (SARDI), Dr Roger Stone (DPI Qld), Chris Souness (DPI Vic), Peat Leith (UTAS) and Dr Robert Fawcett (BoM)

Completed projects

The following projects have been completed under the current phase of MCV. To download project fact sheets, visit http://www.managingclimate.gov.au

Date completed	Project code	Description	Principal Investigator
May-04	QPI48	Managing cropping systems in a variable non-stationary climate	Dr Holger Meinke 07 4688 1378 holger.meinke@dpi.qld.gov.au
Aug-04	QNR31	Managing grazing systems in a variable non-stationary climate	Steven Crimp 07 3896 9795 steve.crimp@nrm.qld.gov.au
Sep-05	ABA12	Enhanced forecasting of farm financial performance	Dr Philip Kokic 02 6272 2063 pkokic@abare.gov.au
Dec-05	BLA2	Masters of climate revisited – innovative farmers coming through drought	Jesse Blackadder 02 6685 8846 jesse@blackadder.net.au
Feb-06	JCU20	Assessing and developing targeted climate forecasts for the sugar industry	Dr Yvette Everingham 07 4781 4475 Yvette.Everingham@jcu.edu.au
Mar-06	ANU49	Agro-ecological implications of changes in the terrestrial water balance	Dr Michael Roderick 02 6125 5589 michael.roderick@anu.edu.au
Mar-06	CLW71	Incorporating climate change in catchment management strategies	Dr Geoffrey Syme 08 9333 6278 geoff.syme@csiro.au
Mar-06	QNR37	Producing, verifying and distributing synthetic evaporation and evapotranspiration data for Australia	Alan Beswick 07 3896 9741 alan.beswick@nrm.qld.gov.au

MCV is a collaborative program between the Grains, Rural Industries and Sugar Research and Development Corporations; the Australian Government Natural Heritage Trust and Department of Agriculture, Fisheries and Forestry; Dairy Australia; Meat & Livestock Australia; and Land & Water Australia. The National Farmers Federation and Australian Wool Innovation Limited are associate partners.

Econnect Communication provides communication support to MCV.
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