

Smart responses to climate change

Producers, agribusiness advisors, researchers and natural resource managers in the drought-stricken dryland grains and mixed farming regions of Victoria, South Australia and Western Australia are working together to respond to a drier and more variable climate.

Representatives from the Bureau of Meteorology, the Bureau of Rural Sciences, Meat & Livestock Australia, the Birchip Cropping Group and Managing Climate Variability have teamed up with local producers and advisors to develop responses to climate change that can be applied on the farm.

'The results are a series of win-win-win scenarios, providing innovative and farm-based options for producers to evaluate for their own enterprises', says Colin Creighton, coordinator of the initiative.

With funding from the National Agriculture Climate Change Action Plan, the team has held initial workshops in Birchip (Victoria), Geraldton (Western Australia) and Adelaide.

Bruce Godwin, an 84-year-old farmer from Berrillock, around 50 kilometres north of Birchip, was one of the 23 participants attending the Birchip workshop. He helps his son Peter on their farm producing wheat, barley, lentils and chickpeas.

'We can't blame the drought on climate change', says Bruce, 'although I do believe the evidence points to changes in the future due to climate change. Our sowing last year couldn't have been better. We had a fortnight of ideal sowing weather at the beginning of May followed by a further 2-3 inches. But the forecasted rains over the next 4-5 months never came.'

The Berrillock region has experienced drought seven or eight times over the past 100 years. Financially and emotionally it will be difficult for some producers to continue if the run of dry seasons does not break soon.

'We can't set our clock on when droughts occur or how long they'll last', says Bruce. 'Our rainfall can vary by 60 per cent either plus or minus'.

Colin Creighton believes that the personal experiences and insights from people such as Bruce are critical to formulating scenarios for the series of farmer forums that his group is planning as a follow on from the initial workshops. 'We want to deliver the best possible information and tools for adapting to and alleviating the impacts of climate change and climate variability', he says. 'This includes delivering the most regionally-relevant climate forecasting and climate risk management approaches, as well as meaningful climate change projections.'



Communicating climate change workshop, Birchip, Victoria



Bruce Godwin

Bruce Godwin is also keen that the farmer forums include marketing and commodity price implications. He believes that any farmer forum should recognise the achievements of producers in the region in adapting to climate variability.

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Keeping the focus on variability

Growing lettuce in Queensland's Lockyer Valley is an exercise in managing climate variability, not just from year to year but throughout each growing season.

Fifth-generation farmer and newly-appointed chair of Managing Climate Variability's Program Management Committee Paul Ziebarth understands the value of a reliable and timely forecast.

'We plant from about Valentines Day through to July and we harvest from April to October. So in one season we go through five temperature periods—hot, warm, cool, and then back to warm and hot again. We change varieties throughout the season and if we get the varietal changes wrong or the weather is variable, there is pandemonium.

'We've always had climate variability but climate change appears to be magnifying it. We need to get on top of that and understand the relationship between the two. It's important that climate variability research not get lost in the sea of climate change. I want to help keep that balance and keep the focus on variability.

'There are several good functional models that farmers use to make cropping decisions but they are only as good as the climate information that goes into them. Better information will give us better models. I am supremely confident in the calibre of our scientists in the climate variability research community and I have no doubt that, given the resources, they will be able to fill the gaps.'



Paul Ziebarth

With stints on the boards of organisations such as the Horticultural Research and Development Corporation and the CRC for Tropical Plant Pathology under his belt, Paul has long been involved with strategic management of science. For nine years he was chair of Growcom, Queensland's peak industry body representing almost 3000 fruit and vegetable growers.

'I've been trained as an applied scientist and that's how I function. I'm interested in the application of science to farming systems, not just science for the sake of science. I want to know, how do we integrate it at farm level to make it useful? When you're sitting on a tractor, what does it mean to you?'

Paul lives in Brisbane with his partner Lisa who comes from three generations of cane farmers. Much of his energy goes into running EcoFoods, a company that focuses on building sustainable supply chains, from the farm through to the consumer. He also finds time to manage Brisbane's Northey St. organic markets, providing farmers with a marketplace in the city's inner suburbs.



'Years ago, most people had some connection with a farm but that's no longer true. So, many consumers nowadays are interested in where the product comes from, who grew it, and how it was grown. They want to know the story of the food.'

There's no better person to tell the story of the Lockyer Valley lettuce.

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South-west WA

farmers to benefit from better seasonal forecasts

With seasonal climate forecasts based on historical data likely to become less accurate as the climate changes, scientists are taking a completely different approach to help Western Australian farmers adapt.

The new approach uses coupled ocean/atmosphere global circulation models. These models are a computer simulation of the world's atmosphere, ocean and land surface based on the laws of physics. They can include the changes caused by increasing greenhouse gases.

The \$2 million project is one of the first projects to be signed up in the second phase of Managing Climate Variability. The project aims to help wheat growers and graziers by better predicting early, mid and late growing-season rainfall, crop yield and pasture growth.

'Over 40 per cent of Australia's wheat comes from Western Australia where there is substantial seasonal variability', says project investigator and CSIRO researcher Dr Senthold Asseng. 'This project is an investment in Western Australia's future, and its purpose is to find ways to improve global circulation models to deliver more accurate seasonal forecasts.'

While the global circulation model forecasts are currently little better than statistical forecasts, they are more likely to deliver a better level of accuracy, despite the changing climate. 'This is possible in the next five to ten years', says Dr Asseng. 'These models are already being used by the Bureau of Meteorology to calculate climate change for the next 100 years and for weather forecasts for the coming weeks. They are now using these models to produce better seasonal forecasts at lead times of six months or more.'

Cameron Weeks, consultant for Planfarm in Western Australia, expects that most farmers are not aware of global circulation models but would support them if they knew their benefits.

'There is not enough skill in statistical forecasts to be of great value', says Cameron. 'An accurate forecast is everyone's dream and using historical relationships would seem of reduced value when we have climate change to consider.'

Dr Asseng's project team will divide Western Australia's wheat-growing region into north and south and use global circulation models to see if these areas need to be managed differently in terms of seasonal forecasts. They will start by focusing on rainfall down to 250 kilometre grids and later look at frost and heat stress.



Dr Asseng [5th from left] with northern wheatbelt farmers

'We also hope to get a longer lead-time forecast for farmers. We'd like to give them information in February on what is happening from May to October; February is when they want to start making most decisions', says Dr Asseng.

While forecasting tools such as the Southern Oscillation Index are useful in eastern Australia, global circulation models offer hope for better seasonal forecasting in Western Australia's wheatbelt.

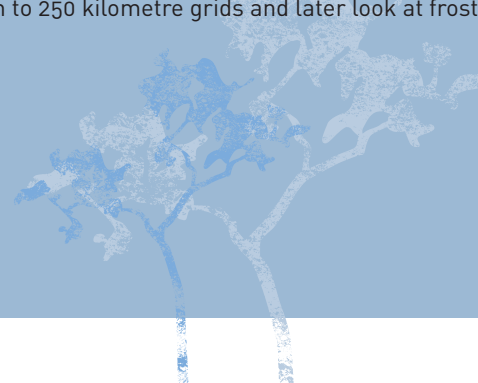
The success of the new forecasts will ultimately depend on how farmers use them to make on-farm decisions.

'Crop management decisions like when and what to sow, how big an area to crop, how much to fertilise, whether to trade on the future markets, and what stocking strategies to use can be improved once we deliver better seasonal forecasts', says Dr Asseng.

'For example, if a seasonal forecast suggests reducing cropping, we need to know what else can be done with the land in such a season to maintain profitability. If pastures are an alternative land use in mixed farming, how should pastures and stocking rates be managed given a specific forecast?'

Dr Asseng's project started in April and runs for three years. CSIRO, the Bureau of Meteorology and Western Australia's Department of Agriculture and Food are all participating in the project.

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What's driving Australia's rainfall?

Australian farmers are one step closer to having regionally-relevant climate forecasting products for managing their farms.

New insights into the relationship between large-scale climate drivers and rainfall patterns in Australia's agricultural regions have been gained from research conducted in a one-year project funded by Managing Climate Variability. The findings are published in the report, 'Australia's Regional Climate Drivers', written by Drs Mike Pook, Peter McIntosh, and James Risbey from The Centre for Australian Weather and Climate Research, a partnership between CSIRO and the Bureau of Meteorology.

Knowing the influence of the El Niño - Southern Oscillation, the Indian Ocean Dipole and the Southern Annular Mode on particular regions in each season could help farmers determine which drivers are most important to their business. 'Simply learning that the influence of the Indian Ocean Dipole is predominantly confined to the second half of the calendar year, and that it particularly affects the agricultural regions of southern Australia, provides useful information for farm managers', says Dr Pook.

'If producers see the Indian Ocean Dipole developing, for example, the positive phase, then they know that finishing rain in southern Australia is unlikely to be as good as they might like it to be. This is an additional influence to the main influences related to the mid-latitude systems, but it still has an effect.'

Dr Pook believes producers who understand rainfall variability associated with the Southern Annular Mode—a measure of the strength and extent of the westerly winds over the Southern Ocean—can make better assessments for their own businesses. The effect of the Southern Annular Mode is clearly confined to the south-west of Western Australia in autumn and the south-west coast of Victoria and western Tasmania in winter.

'Farmers further north in Western Australia need not get upset if the Southern Annular Mode is positive as it really only reduces rainfall at the very south-west of the wheat-growing region in Western Australia in autumn', Dr Pook explains.

Another goal of the research was to identify knowledge gaps and develop a research 'road map' for improving seasonal forecasting skill and reliability.

'What we really need to understand better are the mechanisms linking climate drivers with rainfall', says Dr Pook. 'How do drivers such as El Niño or the Indian Ocean Dipole work through the atmosphere to affect seasonal rainfall?'

Dr Pook and his colleagues are already using the findings in a new project in Western Australia aimed at helping to improve seasonal forecast models for the south-west of the state. The team is working on confidence levels for the existing seasonal forecasting models, in particular the Australian model POAMA, or the Predictive Ocean Atmosphere Model for Australia.

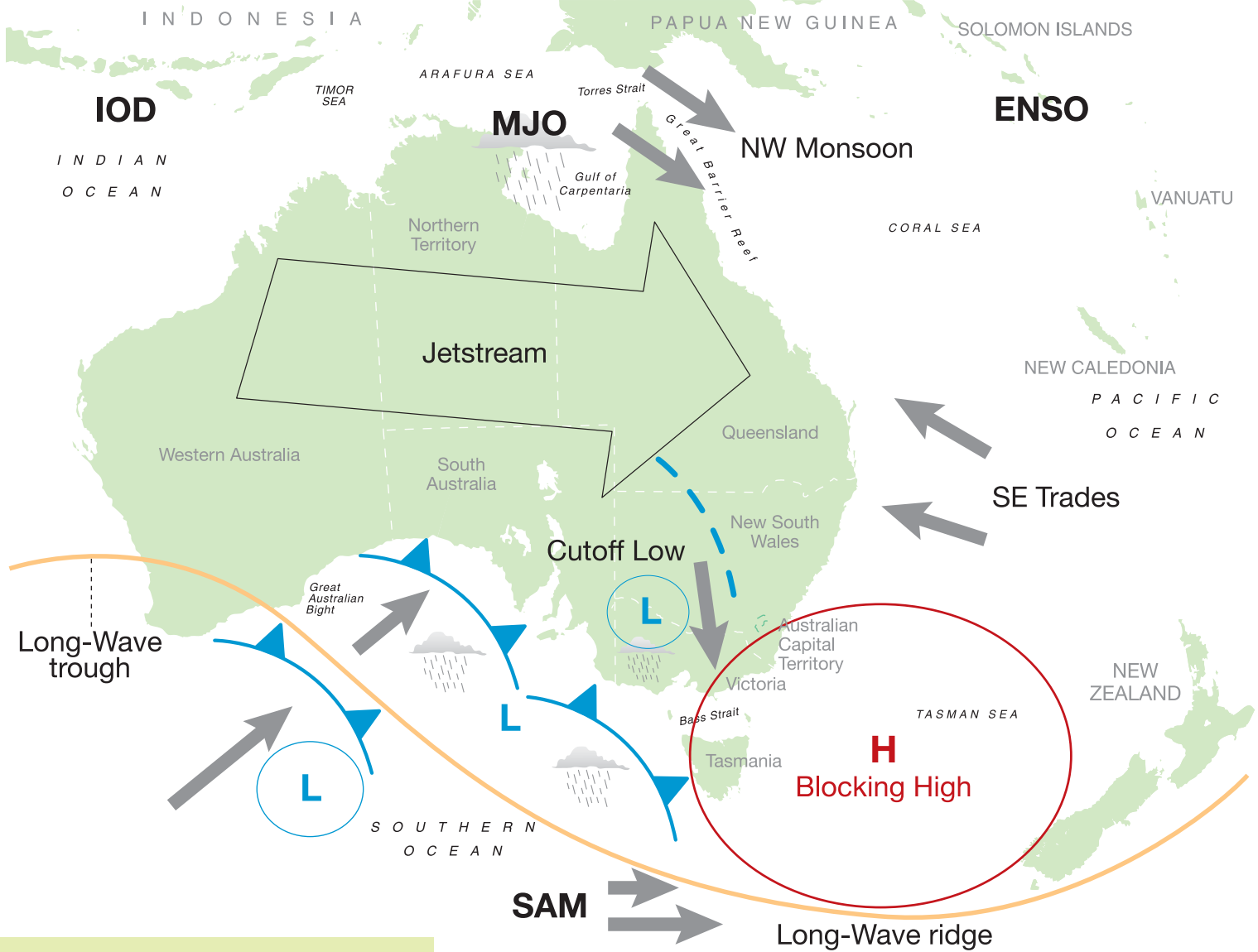


'We'll do this by identifying, for example, the number of cut-off lows (or isolated low-pressure systems) in south-west Australia in a past season, and then we'll look at POAMA and see if it predicts what we've seen. I'm a synoptic meteorologist so I'm interested in analysing real systems. When I look at a model, I want to know that it can simulate real conditions. If it doesn't, it needs to be improved.'

The team is gaining understanding and confidence in the models and working out ways they can improve them.

'We're particularly interested in the mechanisms in the models that produce rainfall, such as cut-off lows, convection cells, large-scale rising air associated with cyclonic systems and fronts, and blocking highs. Our hypothesis is that climate drivers have a background effect on the intensity and location of these synoptic mechanisms. You get a constant interplay between the atmosphere and the surface of the Earth—both the land surface and the oceans. We've got to look at how changes in the ocean transfer through the atmosphere and the effect of land surfaces on those changes.'

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The major rainfall drivers across Australia

Three new ways to view seasonal forecasts

The Bureau of Meteorology has released three new ways of looking at a seasonal forecast. No longer is there simply above and below median outlooks, which many people struggle with.

The forecast for the coming season is now available as:

- 1) a map showing the rainfall amount that has a 25%, 50% and 75% chance of falling
- 2) a map showing the chance of receiving 12 different rainfall amounts, from 10 mm up to 700 mm
- 3) tables for more than 260 towns across Australia, listing the details of the above two maps for each town

The products are available on the Bureau's rurally-focused Water and the Land (WATL) website, www.bom.gov.au/watl.

'We've had very positive feedback on WATL so far and we're keen to make it even better. Getting direct feedback from across Australia helps us to develop the right products,' says Neil Plummer, acting Head of the Bureau's National Climate Centre.

The products are based on a survey of almost 500 farmers and rural advisers who described what they wanted from a climate service. The survey was run by Managing Climate Variability which also supported the development of the products.

'A lot of people who depend on seasonal forecasts to make good decisions struggle to interpret the forecasts for their industry and their region', says Colin Creighton of Managing Climate Variability. 'We are contributing to the Bureau's development of these new products because, for us, the bottom line is helping Australians to better manage climate risk.'

More products will be launched on WATL later this year. Managing Climate Variability and the Bureau are interested in feedback from farmers about the new products.

The 260 towns were chosen to give, as much as possible, an even geographic spread across and between rainfall districts. Each town also has at least 30 years of data.

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Innovators in the Wimmera Mallee

Warwick and Ian McClelland are no strangers to innovating. Over the past 20 years they have participated in many radical changes in farming systems in Victoria's Wimmera Mallee region.

The brothers own 8300 hectares of mixed grains and sheep enterprise outside Birchip. Since 1993, Ian has been chair of the Birchip Cropping Group, a farmer-led group finding ways to apply research and technology for the major crops grown in the region.

In 2003–04, Warwick and Ian were convinced about the effect of the Southern Oscillation Index (SOI) on the region. Now they believe other factors also have a strong influence. And, like the climate scientists they are working with, their knowledge and understanding of what drives the rainfall which the grain industry relies on is building over time.

'I'm more of a believer in the Indian Ocean Dipole (IOD) affecting us in Birchip', says Ian. 'The correlation between the Indian Ocean and the Pacific Ocean and resulting weather has been better understood over recent years. The IOD often flips from positive to negative but this is the third year that it could be positive. It is a worrying trend.'

'The Birchip region seems to experience drought when the SOI is negative or when the IOD is positive, or both. Last year was the first year where the SOI was positive and the IOD was also positive. The lack of rainfall last year shows us how important the IOD is for us. We need to take other factors into account besides the SOI.'



Warwick and Ian McClelland

'We know we get our good rainfall from cut-off lows but the number and intensity of these lows has reduced in the last 10 years. The subtropical ridge is much stronger than usual. The cold fronts get weakened and diverted down south.'

Warwick and Ian believe producers in the region need to be flexible to respond to the market and varying seasons. 'Predicting anything in the region is very difficult', says Ian. 'We've adopted the attitude of reacting to what is happening while thinking about what has been predicted. We need to be able to quickly take advantage of new opportunities or apply new technologies.'

While still regarding themselves as optimists, the brothers say they are more conservative in their farm management this year because of the uncertainty with the climate. 'After you go through a number of droughts, you go for safer options until the drought breaks and you can start taking more risks', explains Warwick.

'We have only had one autumn break in the last 12 years, so we assume now that they aren't necessarily going to happen.'

The McClellands put more of an emphasis on sheep than some other producers in the region. 'One of the benefits of mixing cropping with sheep and grains', explains Ian, 'is that we build up the fertility of the soil more cheaply than with other systems, such as continuous cropping'.

One of the successful changes that the brothers have made recently is the use of feedlots for lambs and containment areas for adult sheep during the autumn period when the soils lose their cover and become quite fragile. If there is lots of cover, then they can still fatten and feed sheep usefully in the paddock.

Dry sowing has become an integral part of the McClellands' strategy to cope with more low-rainfall years. Sowing some crop by date and incorporating as much straw as possible on the top of the seed bed has helped produce better yields for many farmers across the region.



Containment areas for adult sheep on the McClelland farm



'The top 30 centimetres is our workhorse', says Ian. 'Keeping the soil free from weeds is crucial and protecting the topsoil from losing valuable moisture by capillary action is also important. Some farmers do this by cultivating the soil if it is bare; others do it by keeping the straw on the surface of the soil from a previous crop.'

The brothers have also moved to low-input cropping. 'I don't think we've put in a crop at a lower cost than what we did this year', says Warwick. 'It was low last year but it is even lower this year.'

While managing future climate variability poses major challenges, the brothers believe the future is bright for the region. 'Despite the dry years, profits can still be made, and, with the practices that are evolving in the region, the outlook for the future is positive', claims Warwick.

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Order of Australia medal for service to agriculture

Ian McClelland was awarded a 2008 Order of Australia medal 'for service to agriculture, particularly through the development of sustainable crop production systems, and innovative farming and land management practices'. At the ceremony, Ian paid tribute to his colleagues, saying that the award was for the entire Birchip Cropping Group.

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Smart responses to climate change

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'We've changed our farming systems
dramatically. It used to be a strong
emphasis on fallow and now we are
sowing directly into stubble. We rarely
sowed dry but now it is standard practice.
We sow in the prime time rather than
waiting for the rain.'

The first farmer forum was held in Birchip
on 3 July, and will be followed by forums in
Adelaide and northern Western Australia.

For more information on the farmer
forums, contact:

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National Agriculture Climate
Change Action Plan:

[http://www.daff.gov.au/
natural-resources/climate](http://www.daff.gov.au/natural-resources/climate)

[http://www.bcg.org.au/cb_pages/
Communicating_Climate_Change.php](http://www.bcg.org.au/cb_pages/Communicating_Climate_Change.php)



Managing Climate Variability is a collaborative program
between the Grains, Rural Industries and Sugar Research
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