

CLIMAG

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And now for streamflow forecasts — a key new tool in water management



Photo by Nick Clarkson

Wyangala Dam on the Lachlan (see graph on page 2)

Seasonal forecasting of streamflow could be an important tool in managing Australia's scarce water resources, according to Nick Clarkson of Toowoomba. Nick was commenting on the successful completion of the Rainman Streamflow Project, a CVAP project (managed by

Qld Department of Primary Industries) which will be of major benefit in irrigation and environmental management.

The project, from its Toowoomba base at the Qld Centre for Climate Applications, assembled skills across the nation to tackle the highest climate variability in the world. The project was able to exploit the greater impact of ENSO (El Niño and the Southern Oscillation) on streamflow compared with rainfall.

To establish the needs of clients, the Qld Department of Natural Resources worked with four groups of irrigators across the country. At the same time the University of Melbourne was researching methods of seasonal forecasting of streamflow, and seeing how forecasting could help water agencies to improve water allocations. (The SOI, sea surface temperatures and persistence were included).

The Bureau of Meteorology's Hydrology Unit in Melbourne gathered historical streamflow

records for forecasting from collaborating water agencies.

Results will be available to the water industry through a special supplement to AUSTRALIAN RAINMAN, in a CD containing:

- the streamflow data and forecasting tools
- a workshop package developed at workshops with irrigators and water agencies.

The project had made useful progress in offering paths to better water management. Irrigators are keen to learn more about climate variability and risk management, Nick Clarkson said in summarising the three-year project.

The additions to RAINMAN will simplify do-it-yourself forecasting (see graph, page 2). This will give irrigators a better basis for planning and to seek more information from water agencies about the implications of local rules governing water allocations.

For further information contact Nick Clarkson at QCCA, phone: (07) 4688 1248, email: <clarksn@dpi.qld.gov.au>.

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Department of
**AGRICULTURE
FISHERIES &
FORESTRY -
AUSTRALIA**



The Climate Variability in Agriculture R&D Program was initiated and is mainly funded by AFFA. LWRRDC administers the program which is also jointly supported by the following organisations



Mike Logan, new CVAP Chair

Photo by David Coward



CVAP Projects

In the next 12 months, some 20 projects from the current phase of the Program will be finishing.

The next year is critical for projects to complete their objectives and set the basis for further application of their findings.

About CLIMAG

Climag, as the newsletter of the Climate Variability in Agriculture R&D Program (CVAP), has an important role in promoting the overall goal of the program:

To work with the Australian agricultural sector to develop and implement profitable and sustainable management strategies which prepare it to respond to the major opportunities and risks arising from climate variability.

CVAP is a Commonwealth Government funded R&D program, and part of *Agriculture - Advancing Australia*. The major stakeholder is Agriculture, Fisheries and Forestry - Australia (AFFA). The program is administered and supported by the Land and Water Resources R&D Corporation (LWRRDC).

Four other R&D Corporations (see page 1) also currently support CVAP through funding for generic projects and for partnership funding of projects of value to their specific industry or charter.

For further information on CVAP go to the CVAP website at <www.cvap.gov.au>.

The Albury Conference Climate-Management 2000 (see page 14) will be an important opportunity for several CVAP projects to report and get feedback on their approach.

CVAP Perth Meeting

CVAP held a meeting in Perth in March this year which included presentations on the wide range of climate-related activities being undertaken in Western Australia.

The CVAP Committee had the opportunity to meet with the Indian Ocean Climate Initiative Committee to get an understanding of the research being undertaken on the decline in rainfall in the south-west. Projects funded following the Perth meeting are listed on page five.

This was the first meeting for the new CVAP chair, Mike Logan, a Director on the Board of LWRRDC and a cotton grower from Narrabri. The Committee meets in Canberra in November.

Mid-Term Review

The Perth meeting also included presentations on the CVAP mid-term review, as reported on briefly in the last *Climag*, and in full on <www.cvap.gov.au>.

CVAP Chair, Mike Logan, said the review was very useful in identifying the important features of CVAP.

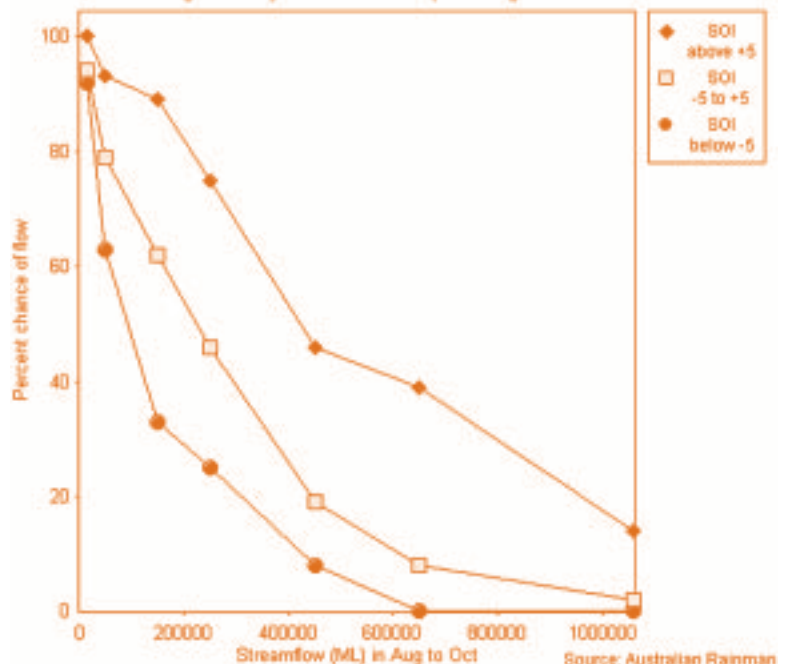
The review showed that the significant achievements of CVAP were due to the strong national network the program had developed between researchers in agriculture, climatology and oceanography.

"Climate variability is a prime example of where a well coordinated national approach to R&D is essential," Mike Logan said.

CVAP tools such as an upgraded RAINMAN with the capacity to forecast streamflow, give farmers and agencies the capacity to build better risk management into their operations," he said.

Wyangala Dam Inflows

Chance of streamflow at Wyangala Dam inflows
Average SOI: May to Jul Streamflow period: Aug to Oct



Getting clever on climate

Guest Spot

By Neil Inall
Founder and Consulting
Fellow
Cox Inall Communications

If you're mixed up in some way with farming you remember the exceptional climate events quite vividly. I could see the whole of the mountains above the Hawkesbury valley alight on black Friday in 1939 I think it was 113 degrees F that day and my Mother sat on our front verandah with her feet in a dish of water and wet towels around her head!

Then flood after flood in that valley in the fifties washing away all my Father's cauliflower crops.

We had no knowledge of the 'whys' of those seasons just accepted them as par for the course. There were mutterings about the words of the climate gods of the day like Inigo Jones and his successor Lennox Walker but widespread scepticism. Do you remember all the CSIRO research on cloud seeding and how Governments stepped up spending on it in dry years? We became more sceptical.

But we've come a long way in our understanding of climate in the last two decades as a result of the research by CSIRO, the Bureau of Meteorology and the Queensland Centre for Climate Applications.

Then more recently other examples, in the Eyre Peninsula, the Indian Ocean Initiative in Western Australia, and Peter Haymans with NSW Agriculture at Tamworth.

Last year's national competition 'Masters of the

Climate' encouraged some valiant managers to reveal how they were using the results of that research to help them in managing their piece of the landscape. Often Rainman was a really valuable tool in their decision making. But given our inbuilt scepticism, no doubt many of their neighbours scoffed when they heard or read of those reports!

And so there's a huge challenge for all of us in the extension/information business whether we work for Governments or commercial firms to keep ourselves up to date on that research and to incorporate the findings in all our work. We've got better tools now than we've ever had to spread the word. Too many of us though seem unable or unwilling to incorporate this new knowledge into our daily work. We often whinge that farmers won't change - perhaps many of them are saying the same thing about us?

There's every chance that the generally better seasons in the eastern states in the last



couple of years have lulled us into believing that long dries won't happen again. They will as you know. But with all our 'new' knowledge about climate why haven't we set up a national early warning system about the likelihood of 'long dries' in different parts of the country? Scare people? Good!

Surely any national program of sustainability in this country ought to incorporate a 'big dry' alert system. ●

CVAP factsheets and website

A set of CVAP factsheets, including factsheets on each of the research projects funded by CVAP and four general factsheets on the program, have been developed.

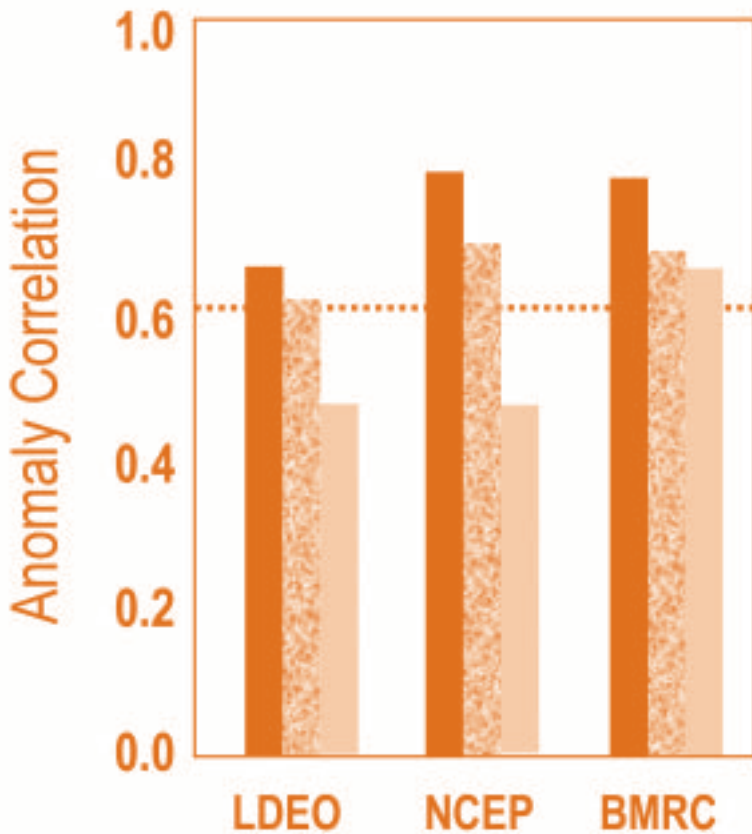
The factsheets are available from the CVAP website at <www.cvap.gov.au> under 'Projects', or by contacting Holly Mahoney at Capital Public Affairs Consultants on phone (02) 6248 9344, fax (02) 6257 3363, or email <cpac@dynamite.com.au>.

To learn more about each of the CVAP research projects please refer to the contact details of the project leader on each factsheet.

CVAP website

The CVAP website also includes links to other climate variability publications, this issue and the three previous issues of *Climag*, an *About CVAP* section, a *What's New* (updated at the beginning of each month) and *What's Coming Up* section, as well as other useful links. The Master of Climate stories (see page 14) are a new feature. ●

Fortune Telling and Climate



The graph above shows an intercomparison of the skill of the BMRC/CSIRO Marine Research COR5 model with the Lamont Doherty (LDEO) and the US National Centers for Climate Prediction (NCEP) models, at lead times of six (black), nine (grey) and twelve (hatched) months. The COR5 model is standing up well.

Being able to predict the future has always been regarded as a fortunate skill. Advanced knowledge can deliver on fortune or, at the very least, a chance to avoid bad luck. For matters of climate, we now believe science and scientific knowledge provide greater opportunities for success than divine spirits!

The Bureau of Meteorology Research Centre and CSIRO Marine Research, with the support of CVAP, have joined forces to develop a new generation forecast model as part of the COR5 project.

Scientists long knew that knowledge of the physics and dynamics of the climate system offer a potentially powerful 'crystal ball' for prediction.

Such dynamical and physical laws hold to great precision and, at least in theory, provide a more robust way of taking

what we know today and foretelling what might be in the future.

Coupled ocean-atmosphere models construct a mathematical representation of the climate state (temperature, winds, currents, etc) over the full global domain of the atmosphere and ocean, and over long time intervals (at least several seasons).

This involves many numerical equations, some with strong foundations in

physics, but others that also include their own form of empiricism.

This explosion in generality and degrees of freedom compared with empirical approaches comes at a cost since the models also permit a wealth of opportunities for errors and bias, both natural and unnatural, to creep into the solutions.

At first this was managed by simplifying the models, for example reducing the atmosphere and ocean to single layers, and reducing the complex physical interactions to a series of empirical relationships.

Contemporary models are more complex, rivalling those of weather prediction, and are slowly but surely, taking over as the preferred methodology for prediction. The model follows the initiation and evolution of coupled ocean-atmosphere waves to forecast

climate variability - the ability to 'ride' these waves into the future is the scientific equivalent of the crystal ball.

Our experience is that we need to carefully observe climate variations or, more specifically, the ocean in order to properly initialise the model.

Forecasts from this model are now being generated every 10 days and are being evaluated through the Seasonal Climate Outlook meetings at the Bureau.

Intercomparisons with other models suggest the model is very competitive, particularly at longer lead times.

The present forecasts (see <http://www.bom.gov.au/bmrc/mrlr/fzt/CM/page1.html>) are indicating a mild warming through the early part of 2001 but, as yet, nothing that would suggest a significant El Niño.

As part of the project, Peter McIntosh has a report available (email: peter.mcintosh@marine.csiro.au) on the workshop he convened connecting climate model forecasts with agricultural management systems. Unlike agricultural models which can often be run using a century of historical rainfall, climate and ocean models are usually constrained by data which is only available for a couple of decades.

Improved climate forecasts are totally dependent on global climate observations and data bases, in which Australia is a key participant.

For further information contact Neville Smith on email: N.Smith@BoM.gov.au,

or Gary Meyers on email: Gary.Meyers@marine.csiro.au.

CVAP funds three new projects

Two projects building on products developed during the recently completed SILO project; and one on the north-west cloudbands have been funded by CVAP.

The three projects mark the end of R&D project funding in the third phase of CVAP. The projects will be completed during 2001.

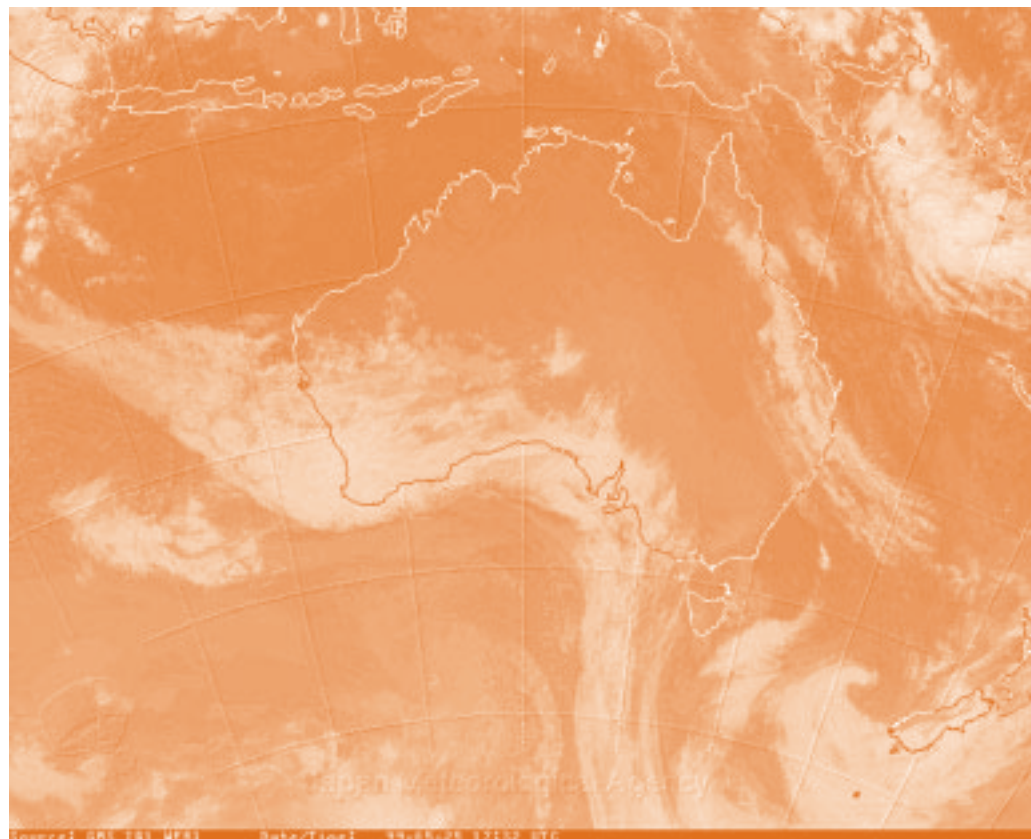
The three projects are:

SILO tailored to users location and preferences for presentation. (Dr Scott Power, National Climate Centre, Bureau of Meteorology.)

The project will use market research and consultation with users to refine communication of climate products, particularly to tailor products to individual needs. Localised forecasts for seasonal rainfall and temperature are a priority.

SILO II - Extension, Marketing and Industry Focused Product Development. (Alan Beswick, Queensland Department of Natural Resources.)

The project will concentrate on marketing of some specific products developed during the initial SILO project. Ready availability of a wide range of climate data of value in



Satellite image taken from BoM Website

managing agriculture and natural resources has been a key objective of SILO. The Patched Point Dataset is one product which provides continuous daily meteorological data. Gaps in the historical record have been patched so that simulation and prediction systems can be run to analyse decisions and improve risk management. Examples and further information are available through the SILO site, see <www.bom.gov.au/silo/>, or from <www.dnr.qld.gov.au/resourcenet/silo/index.html>.

Gary Meyers, Project leader for COR5, discussing the cloudband project with Nicola Tecik. Nicola has developed a system to track and analyse cloudbands (see new projects).



The influence of north-west cloudbands on eastern Australia rainfall. (A/Prof Charitha Pattiaratchi, Nicola Telcik, Coastal Oceanography Group, University of Western Australia.)

This project will extend a study undertaken in Western Australia which developed highly effective methods to analyse and classify cloudbands (see satellite image above).

Cloudbands are also a source of eastern Australia rainfall and the study will enable a detailed analysis of how they interact with troughs and frontal systems, and how their activity varies with atmospheric and oceanic indicators (SOI and SST).

For details and work in progress on annual indices of cloudband frequency see <www.cwr.uwa.edu.au/~telcik/menu.html>.

Cloudbands were a feature of May 1999. The satellite photo of 25 May shows a cloudband and associated front which produced 100mm north of Adelaide. The cloudband formed on 23 May over the eastern Indian Ocean and was dragged across the continent by a frontal system. It caused widespread rainfall over south-western Australia.

Building dairy farmer demand for climate information

More work needs to be done to create effective demand for climate information, according to a recent CVAP/DRDC project with Victorian dairy farmers. Researchers Brendan Madden and Greg Hayes concluded that effective demand requires both a felt need for the information, and the capacity to use it and benefit from it.

The project supports the view that the limited ability to use probabilistic climate information in farm management decision-making is one of the major limitations on the use of climate forecasts by Victorian dairy farmers.

The farmers involved in the study demonstrated a range of abilities in using probabilities to rank the chances of an event, but even those most competent in using probabilities were not prepared to use probability-based information in management decisions.

Farmers wanted certainties. In effect they were saying, *I*

am facing a decision about just one year, which could have a major impact on my business, and not 100 years I need to know what to do this year.

One way of improving farmers abilities to use probabilities may lie with the chocolate wheel approach pioneered by Peter Hayman. Demand can also be built through industry initiatives assisting dairyfarmers to deal with aspects of risk and business management. The study found that climate risk was generally ignored in such programs except in times of drought.

Part of the reluctance of farmers to use probabilistic climate information relates to confidence in seasonal forecasts. But many of the dairy farmers involved in the study confidently use weather information in their tactical (day-to-day) decision-making.

Weather information appears to be a very good hook on which relationships, contacts and trust can be built with dairy farmers.

Dairy farmers who do attempt to use climate information look for locally specific, reliable

information reported in measures to which they can relate. Local rainfall probability tables expressing the chance of receiving certain amounts of rain over a season are one way of meeting this need.

Much frustration was expressed about the current lack of locally specific information and the need to scan numerous sources, particularly on the internet.

In some cases this lack of coordination and inconsistencies between sources was the reason for disregarding climate information and El Niño predictions.

The dairy project showed that improving communication will clearly require a two-sided approach with:

- demand nurtured through existing risk management programs and via linkages to weather information, and
- as demand grows, providers need to develop a locally specific, readily accessible supply of quality information which meets their demand.

For further information, contact Brendan Madden or Greg Hayes at The Virtual Consulting Group phone: (02) 6041 1150 or email: <brendan@virtualgroup.com.au>.

BC and Better Communication



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Seasonal forecasts helping northern Murray Darling irrigators

Larger cotton growers are making the most use of seasonal forecasts in the northern Murray Darling, according to a recent survey of 931 irrigators.

The Queensland Centre for Climate Applications (QCCA) conducted the survey to explore knowledge of climate, information needs, and how irrigators make decisions on cropping area.

The survey was designed to aid uptake of research from the Murray-Darling Basin Commission-funded project 'Decision Support Systems for improving water use efficiency in the northern Murray-Darling Basin'.

Response to this 128 question indicative survey was about 20%. Key findings of the survey include:

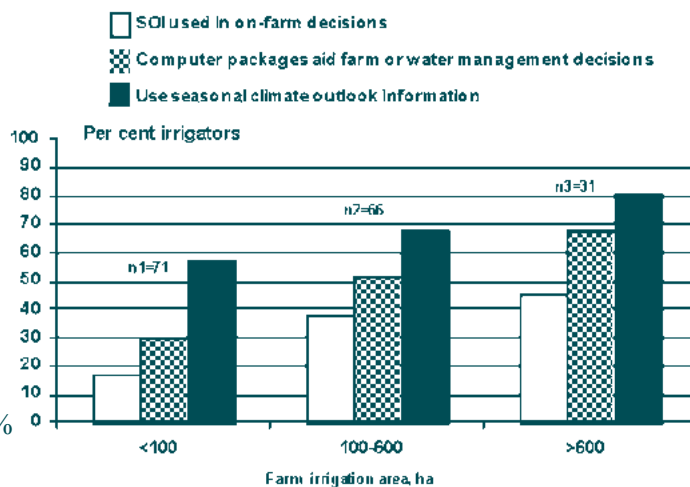
- Almost one third of respondents apply the Southern Oscillation Index (SOI) to on-farm decisions.
- Technology uptakes increases with irrigation area, the majority being cotton growers.

- Two-thirds seek information on seasonal climate outlook, the most popular source being mass media (print, radio, and television).
- Given advance information on probable streamflow, 74% indicated they may change their planting area and 43% their crop type.
- About 55% said an information system on climate and water availability would be useful in decision-making.
- Some 67% rate their personal computer skill as nil or basic.

Irrigators demonstrated a good understanding of the relationship between ENSO and rainfall in Australia in four climate test questions.

However, only one third rated a working knowledge of SOI, a quarter understood the terms mean and median rainfall

Technology uptake increases with farm irrigation area



and probability of exceedance, and even fewer the terms SOI phases (12%) and sea surface temperatures (14%).

For further information on the MDBC water resource project contact Yahya Abawi, from DNR on phone (07) 4688 1123 or email <abawiy@dnr.qld.gov.au>.

To obtain a summary of survey results, please contact Diane Keogh from DNR on phone (07) 4688 1136 or email <keoghd@dnr.qld.gov.au>.

Something in the Eyre

June 2000, and a rare inflow redefines Lake Eyre. With the Lake's basin covering one-sixth of the continent, a major climate pulse such as La Niña is usually needed to push flood waters through some of the rivers that meander in space and time to Australia's lowest point.

The record recent filling of 1974 is now redefined as a major La Niña event.



Aussie GRASS — finishing with a growth spurt...

Variability and vastness are the twin challenges in keeping track of the state of Australia's grazing lands.

Aussie GRASS, a major CVAP project has met the challenges by pooling the skills and experience of eight State agencies.

The visionary team of 30 have contributed to the core tool, a pasture simulation model on a 5km grid, nationally.

Historical or forecast rainfall is one of the many inputs.

Involved in the project are the Qld Dept. Natural Resources (QDNR), Qld Dept. Primary Industries, Agriculture Western Australia, Primary Industries and Resources South Australia, Dept. Environment, Heritage and

Aboriginal Affairs (SA), NSW Agriculture, Dept. Land and Water Conservation (NSW) and the NT Dept. Primary Industries and Fisheries (NTDPI&F).

Much of the impetus for the Aussie GRASS project arose from the need for accurate near-real time data in order to make timely management decisions.

Aussie GRASS delivers a range of client-focused products for resource managers to make more effective decisions, especially with regard to drought and degradation risk.

The power of the simulation approach is in being able to see the trend, and accurately place the current situation in its historical context.

The map (below) shows pasture growth for the last year compared with the last 40 years.

The model currently generates products on a monthly basis with the range including maps of rainfall, pasture growth, total standing dry matter, curing index and grassfire risk. All are on the Aussie GRASS web site which collaborating agencies are able to access.

The web site will be opened to the public on endorsement of the project's Final Report, currently being prepared.

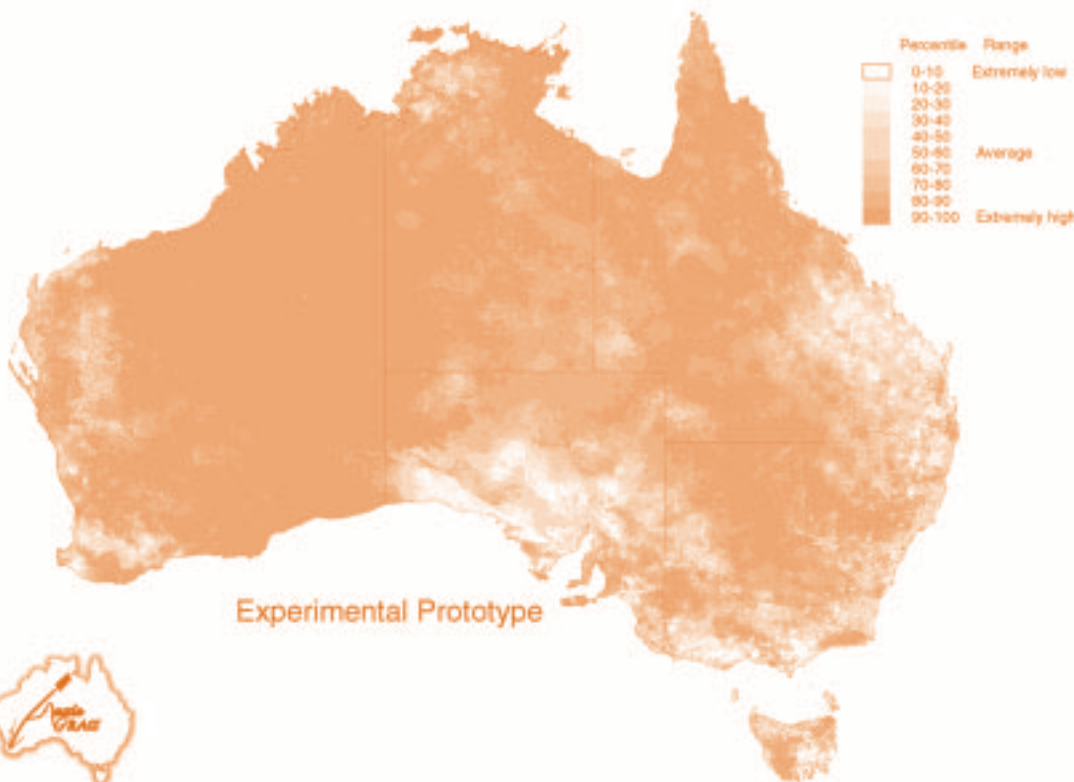
The project, through its team building, has generated valuable new collaborations.

The QDNR and NTDPI&F are working together with the CRC for Tropical Savannas to improve the range of Aussie GRASS products available to fire managers in northern Australia — products developed with clients such as the relevant rural fire services.

The Queensland Centre for Climate Applications is currently making available maps and other information on active fires across eastern Australia via the Aussie GRASS web site.

For further information, please contact Wayne Hall (National Technical Coordinator) on phone: (07) 3896 9612, or email: <wayne.hall@dnr.qld.gov.au>.

Pasture Growth Relative to Last 40 Years Australia - September 1999 to August 2000



Experimental Prototype



Can climate forecasting prevent land and pasture degradation?

The history of sheep and cattle grazing in Australia's rangelands is not without paradox.

Sagas of pioneering property development in harsh environments contrast with degradation episodes. History includes devastating droughts resulting in major government inquiries and intervention.

Sometimes degradation episodes have been followed by recovery periods. For others, all that was left was scalds and woody weeds.

"We can learn from history that we do not learn from history" - Hegel

Challenging Hegel, a group of idealistic scientists, supported by some visionary funding, set out to build a drought/ degradation alert system - 'Aussie GRASS' (page eight).

In the CVAP project described here, eight historical degradation episodes (see map) are being assessed to learn how an alert system might have operated if we could rewind our current knowledge.

Most of the episodes were preceded by a build-up of stock numbers (and rabbits too) in response to periods of good seasons and substantial price variation. In eastern Australia, good seasons occurred in the early 1890s, late 1910s, early 20s, mid 50s, early 70s and late 90s. The CVAP project on Decadal Variability now tells us that quasi-decadal changes in the Pacific Ocean sometimes resulted in amplified La Niña conditions on rainfall in eastern Australia.

A multi-state team of ecologists and resource

managers is reconstructing these historical episodes using simulations of pasture growth, historical time series of animal numbers, and the behaviour of climate forcings (ENSO, IPO -the Inter-decadal Pacific Oscillation, and high pressure systems). Historical evidence indicates that where conservative stocking policies have been adopted, or where rapid reduction in stock numbers occurred in response to the onset of drought, degradation appears to have been minimal.

Although the Pacific decadal oscillation pattern is not yet fully understood, its behaviour has had a strong effect on historical degradation and recovery episodes. Paradoxically these wet periods have contributed to degradation episodes by:

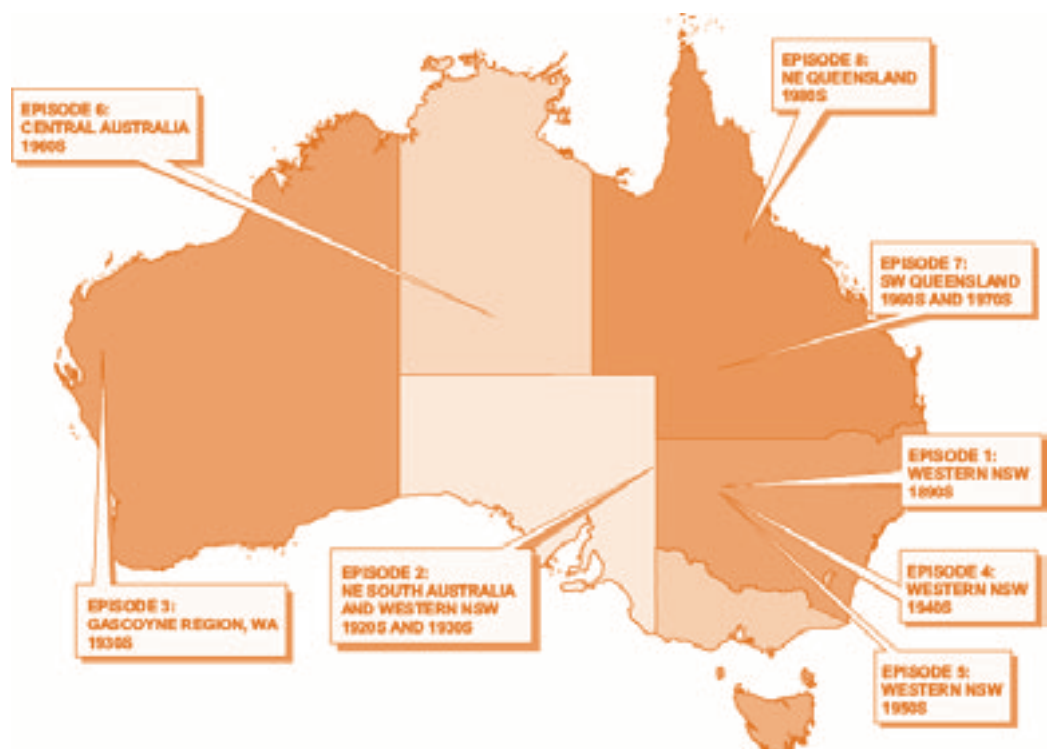
- biasing expectations of carrying capacity - too high to be sustained through subsequent dry and drought periods, and

- providing the conditions for woody weed establishment - in the absence of fire decreasing desirable perennial grasses and carrying capacity.

But the wet periods described also provided the opportunity for some recovery of vegetation after degradation episodes, through regeneration of desirable perennial species. Thus this aspect of the Pacific Ocean behaviour (La Niña and negative IPO conditions) is actually a very important component of the resilience of eastern Australia's rangelands.

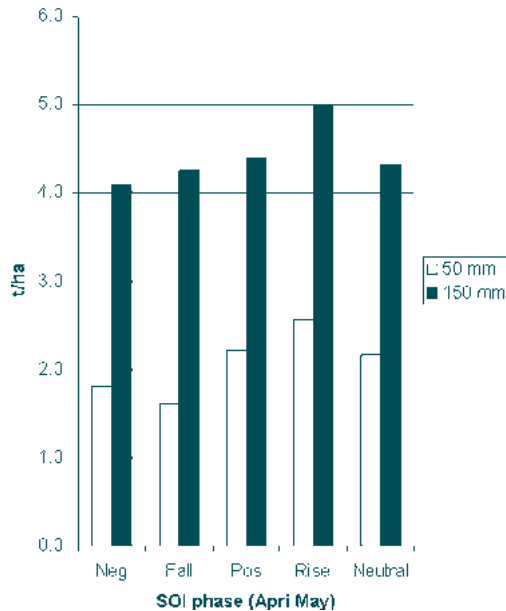
The uncertain impact of future global warming on this aspect of Pacific Ocean behaviour indicates that we should not take this climatic component of resource resilience for granted.

For further information contact Greg McKeon, Queensland Centre for Climate Applications, Indooroopilly, on phone: (07) 3896 9548, or email: <greg.mckeon@dnr.qld.gov.au>.



Better crop choices - Combining moisture in the bank with the moisture to come

APSIM simulated wheat yields at Gunnedah for 50mm and 150mm of water stored at sowing



Decisions on what to plant and when to plant now have a better information base - thanks to a major CVAP project in the northern grain region.

Project leader Dr Roger Stone, (See *World First Climatology Degree* story at right), said a key part of the project was to successfully embed climate forecasting into a crop simulation system. The well-known APSIM model now has a climate forecasting system built into its engine and is available for analyses of farming systems.

The project was funded by CVAP in partnership with GRDC and RIRDC. The aim was to build on research using the Southern Oscillation Index for tactical crop decisions.

This pioneering research began at Toowoomba a decade ago. But the big decisions on crop

choice and manipulating cropping sequences needed more powerful tools. Also needed was the capacity to evaluate newer forecasts based on sea surface temperatures.

Some general findings across the northern grain areas follow:

- Comparing SOI phases, highest potential (and often lowest risk) wheat yields are associated with a rapidly rising SOI.
- Differences between phases are typically much less with a full profile at planting (See graph for Gunnedah, courtesy of Peter Hayman, NSW Ag).
- For risk management of crops such as chickpeas grown as an opportunity crop, a threshold planting criteria for soil water can vary from 40 to 90 mm depending on SOI phase.

The project researchers worked directly with case study farms to test options from the crop simulation analyses. Rainfall records for the last century were used in a crop model to estimate what yields would have been for each year. The farmers could ask what if questions to guide their cropping choices.

For two case study farmers, increased profit from opportunity cropping based on the cropping simulation totalled about \$100,000 in 1998. Crops simulated included

wheat, chickpeas, sorghum and cotton. But 1998 was an unusual year with a rapidly rising SOI through May and June. The project has made it much easier to identify situations and years when a forecast can be valuable. Profit, risk, and sustainability aspects can be assessed.

As Roger Stone states: "The project has shown that, for some decisions, there may only be a need to use seasonal forecasts on an opportunity basis. We are now in a much better position to identify years where there is obvious skill, and the cropping decisions where that skill is likely to increase profits".

For further information contact Dr Roger Stone at QCCA on phone: (07) 4688 1293, or email: <stoner@dpi.qld.gov.au>, or Holger Meinke (QDPI) at APSRU on phone: (07) 4688 1378, or email: <meinkeh@dpi.qld.gov.au>.

World First Climatology Degree

A shortage in skilled climatologists has led the University of Southern Queensland to offer the world's first stand-alone Bachelor of Science in Climatology Degree.

Dr Roger Stone has been involved in the development. His new role will include part-time work at USQ as Associate Professor, in addition to research at the Toowoomba location of the Queensland Centre for Climate Applications.

Not all El Niños are created equal

Fast forward to autumn 2002, and let's say oceanic indicators are suggesting a strong El Niño.

Will this event produce widespread drought as in 1982 and 1994, or will it be punctuated by timely rains, as in 1987 and 1997?

Bill Wright from the Bureau of Meteorology is after the answer in a CVAP-funded project.

As Bill states: By April to June we can normally tell whether an El Niño event is likely to develop, and on that basis, estimate the likelihood of above or below average rainfall in the coming months.

"But not all events behave as the long-term record suggests they should. Is there a way of specifying, in advance, which years will behave like 'typical' El Niños and which will be 'rogue' years?

Atmospheric, oceanic, and other factors that might affect,

or alternatively reinforce, rainfall patterns during El Niño and La Niña events are being analysed.

Recent research has suggested that certain modes of climate variability can act like 'switches', capable of fundamentally affecting the way the El Niño - Southern Oscillation phenomenon affects climate.

The Interdecadal Pacific Oscillation, described in the March 2000 issue of *Climag*, is one of these, but there are others.

For instance, rainfall patterns differed in El Niño years depending on whether subtropical ocean temperatures were unusually warm or cool.

We are also investigating whether ocean temperatures away from the subtropics, and atmospheric circulation patterns, differ systematically between 'typical' and 'rogue' El Niño events?

It takes many years of data to build-up statistical relationships robust enough to be used as predictive tools, and we probably don't yet have enough historical El Niño events.

What our preliminary results do suggest, however, is the potential for improvements to existing prediction schemes, provided the statistical results truly represent cause-and-effect relationships.

Results also suggest scope for improved predictions (in some circumstances) during neutral conditions.

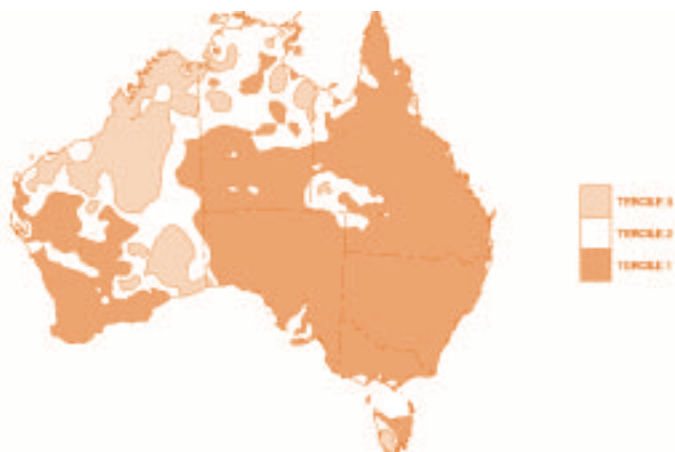
Future work, including climate modelling approaches, could establish a firm physical basis for the statistical relationships.

For further information, please contact Bill Wright at the National Climate Centre on Ph: (03) 9669 4781 email: <w.wright@bom.gov.au>.

Though both 1994 and 1997 were strong El Niño years, the rainfall patterns in the critical July to December period were very different. Tercile 1 represents below normal rainfall; tercile 3 represents above normal rainfall. Research is attempting to uncover ways of predicting such differences in advance.

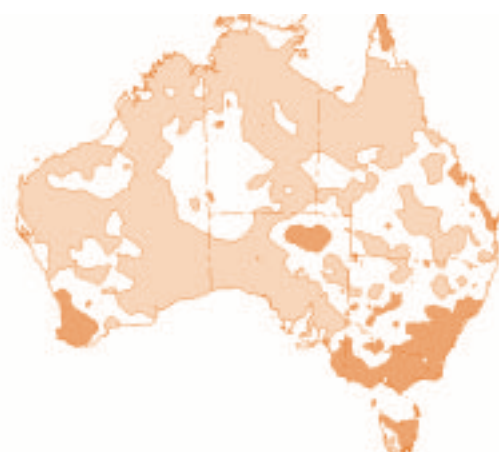
Widespread drought in 1994

Australian Rainfall 1 July to 31 December 1994



Timely rains in 1997

Australian Rainfall 1 July to 31 December 1997



Two new tools tracking exceptional events



Written by Tim Brinkley and Prachi Jain

Impacts of climate extremes on rural communities can now be better assessed and responded to. Two new tools from a CVAP project are contributing to more timely policy advice for Exceptional Circumstances assistance from the Commonwealth Government.

The more extreme drought, flood and frost events are examples of regional climatic factors that can be involved in rare and severe events. Tools are needed to quickly and accurately bring together a wide range of spatial and historical information, information often collected for other purposes.

The research is being done by the Bureau of Rural Sciences, a research bureau of the Commonwealth Department of Agriculture, Fisheries and Forestry –Australia.

Rainfall Reliability Wizard

(Figure 1 Spring (Sept-Nov) rainfall) - The *Wizard* is used for broad scale and first-stage analysis of rainfall across Australia. Grids (25x25km) of monthly rainfall are a key



Figure 1 - 'Spring (Sept-Nov) rainfall'. A broad-scale analysis shows averages of less than 50mm in much of the inland (darker shadings) and up to around 200mm in some coastal areas (lighter shading). There are also patches (greyer shading) of higher rainfall in the eastern highlands and Tasmania, and in the south-west.

input from the Bureau of Meteorology. An example is - how unusual was the rainfall recorded for a particular season? The *Wizard* is used to determine a rainfall amount, for example for autumn, and then used to calculate the percentile ranking for that season against the historical record (100 years). Other

analyses include inter and intra-seasonal reliability.

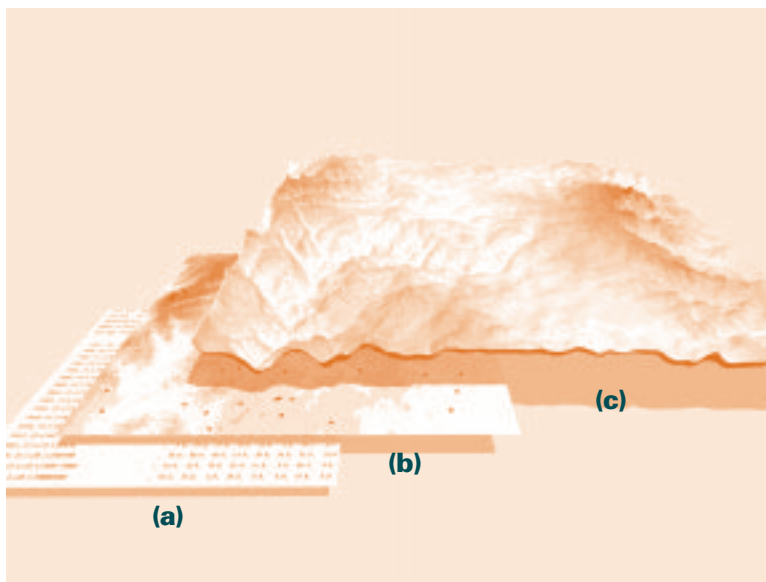
Integrated Toolset

(Figure 2) - The *Integrated Toolset* provides BRS with an independent capacity to interpolate surfaces, with full error diagnostics, from multiple point data.

The *Integrated Toolset* has been developed as a set of ArcView extensions that incorporate ANUSPLIN (a spatial interpolation model developed by Mike Hutchinson, ANU). Other features include easier use of raster and vector datasets, and using the toolset with the SILO database.

For further information, please contact Greg Laughlin on phone: (02) 6272 3581, or email: <gregory.laughlin@brs.gov.au>, or visit: <<http://www.brs.gov.au/agrifood/climate.html>>.

Figure 2 - The *Integrated Toolset*. An example of the procedural stages used to analyse and visualise variation in rainfall across a region: (a) Data are obtained from SILO. (b) Rainfall data are then integrated with the AUSLIG 9 second DEM (Digital Elevation Model) in a GIS. (c) Finally, rainfall data are spatially interpolated using the *Integrated Toolset*. This final surface is shown as a 3-D visualisation for more effective communication.



International workshop report - messages for managing climate risk

Seasonal forecasts better tailored to cater for the range of farmer situations. This was one direction amplified by the International Workshop - *Farm Management Decisions with Climate Risk*.

The Toowoomba Workshop was hosted by the Queensland Centre for Climate Applications with support from the UQ Dept. of Psychology. Other partners were CVAP and the Australian Centre for International Agricultural Research (ACIAR).

The Workshop itself took some risks, worthwhile in the event, in terms of the diversity of invited participants. ACIAR are funding an international project on the benefits of seasonal climate forecasting in agriculture. The 10 ACIAR participants come from Indonesia, India and Zimbabwe.

The Workshop had three main themes:

Probabilities

Scientists see the concept as more relevant than do the customers. Messages in numbers get a different reception to those in words.

(Try sampling a few opinions on what probable means in terms of % chance, or even odds).

Good decisions

Bad outcomes and poor skill in decision-making are more likely when outcomes are dominated by human behaviour rather than physical science. Research on decision-making in many fields (as presented by Prof Shanteau from Kansas) shows that expertise is highly variable, ranging from high for weather forecasting to low for stock broking and personnel selection.

Capacity to monitor and learn, and expectations also vary. Outcomes for farmers decision-making depend on physical and economic variables. They have to integrate climate-related risk with all the rest. As Bill Malcolm said: "It is better to solve the whole problem roughly, rather than to model elaborately and solve a part of the problem extremely well".



Communication

Key messages for extension recognised farmer differences including their capacity to respond. While scientists reasonably view skill in climate forecasting as reducing risk, many farmers face risks and costs in acquiring new information and integrating this into established risk management routines.

Dr Shrapnel reported on her research with Central Queensland farmers. The sample had a limited coverage of personality types. The major traits were likely to be an advantage in meeting many of the challenges of farming - but less so in terms of coping with change through group learning approaches. This presentation attracted wide spread media interest, concentrating on the need for a policy mix sensitive to the varying capacity to change. (Ed.)

The Workshop summary and proceedings are being published through QCCA.

For further information, contact David McRae at QCCA on phone: (07) 4688 1459 or email <mcraed@dpi.qld.gov.au>.

Dr Geethalakshmi from Tamil Nadu Agricultural University in India being presented with a workshop certificate by Dr Kep Coughlan, formerly ACIAR.

Climate Risk Management Training workshops in southern Australia

The Climate Risk Management Training Kit developed by SARDI (as part of a Grains R&D Corporation project) is being used by agronomists, researchers and educators (trainers) to run their own specialised climate risk management training workshops for landholders in their region. So far 50 trainers in southern Australia have attended one-day interactive courses to become accredited.

For more information contact Melissa Truscott on phone: (08) 8303 9639 or email: <truscott.melissa@saugov.sa.gov.au>.

WHAT'S COMING UP

Masters of the Climate Launch

Case studies showing how 23 farmers and land managers are putting climate information to work will be launched at the Albury Conference Cli-Manage 2000 (story this page).

The Masters' stories are from around Australia and show the ingenious ways farmers are tapping into new sources of climate information.

The stories will be a useful source for rural media and for researchers to access local examples of pioneers in applying the breakthroughs in climate research.



masters
of the climate

Unearthing better ways of using
climate information to improve land management

For more information contact
Cox-Inall on phone: (02)
9956 7755, or see the
studies at
<www.cvap.gov.au>.

Cli-Manage 2000, Albury NSW, October 23-25, 2000

The Albury Conference Cli-Manage 2000 is shaping as an important opportunity to see how a range of industries are managing climate variability. Climate change is also on the agenda, together with case studies and sessions on how climate services can better support decisions on climate-related risks and opportunities. Over 100 people have already registered for the CVAP-supported conference, which is being hosted by the National Climate Centre of the Bureau of Meteorology.

See <http://www.bom.gov.au/climate/cli2000/regist_new.html> for the program, or contact the Bureau of Meteorology on phone: (03) 9669 4072.

IOCI Seminar Perth, November 9 2000

The Indian Ocean Climate Initiative will be reviewed as part of the seminar in Perth on 'The Oceans, the Atmosphere and Climate Variability in south-western Australia'.

For further information, call Ian Foster on phone: (08) 9368 3642, or visit <<http://ioci.commerce.wa.gov.au>>.

ANZ Climate Forum, Darwin, 18 - 21 September 2001

Darwin will be host for the first time of the Australia-New Zealand Climate Forum. The latest research and applications

of climate science in Australia and New Zealand will be presented at the Forum.

Tropical climate will be one theme for the 14th Forum to be held. Aspects include monitoring and prediction, and research and impacts of climate on habitat, rainforests, building and construction, trade and weather-related natural hazards.

The Forum will be a good platform to discuss various management, education and partnerships issues with a common theme of weather and climate.

For further information contact Hakeem Shaik on phone: (08) 8920 3814 or email: <h.shaik@bom.gov.au>. Watch for updates at <www.bom.gov.au> (follow links to conferences).

Odds and Sods

Learning from historians - "If, in the year 2000, there were adequate seasonal forecasts for each Australian region, the forecast of a drought in one region would almost certainly be paralleled by moderate or over optimistic forecasts in at least a few other regions." Prof Geoffrey Blainey at a 1979 Conference.

Siesta Ma ana - "The siesta is probably a good idea." Kurt Davis, Ozone Action, responding to more frequent heat waves in the USA.

Bin-counter - "One of the biggest and most important tools of theoretical physics is the wastebasket." Richard Feynman.

Half-truths - "Half of what you are taught will in 10 years be shown to be wrong. And the trouble is none of your teachers know which half." Dean of Harvard Medical School.

It's not cricket - Centrebet declined to take wagers on who would light the Olympic flame, "as the result would be predetermined!"

Shifting the goalposts - "We have had consistently big crowds, but there will come a point where results will matter." Rabieh Krayem, NQ Cowboys.

Risk Capital - "Risk taking is the fine line we tread between fear and opportunity." ABC TV show *Risk* on Queenstown NZ, the adventure capital of the world.

Clever Country ? "How do you learn from a crook choice if it is cleverer to blame bad luck?" Bush philosopher.

October Test - It rhymes with month?

NEWS AND REVIEWS

Catching climate in the Net

A recent survey of farmers has identified the Internet as an under-used source of climate information. Sixty-two farmers in the perennial pasture zone of SA, Victoria and Tasmania were asked a range of climate-related questions as part of a CVAP project.

One in four surveyed farmers were using the Internet to obtain farming-related information. Yet only one or two were accessing climate/weather information in this way.

It seems they are generally unaware of what is available. All farmers agreed that an improvement in their understanding of climate issues would be of great benefit to their businesses. The survey was carried out by Liz Austin at DNRE, Hamilton.

Book Review

Applications of Seasonal Climate Forecasting in Agricultural and Natural Ecosystems - The Australian Experience, edited by Graeme Hammer (QCCA), Neville Nicholls (Bureau of Meteorology), and Christopher Mitchell (CSIRO).

Atmospheric and Oceanographic sciences library. Volume 21. Kluwer Academic Publishers, ISBN 0-7923-6270-5, 482 pp.

The state of the science in climate forecasting is reviewed before considering detailed examples of many pioneering applications. The 27 papers include coverage of projects involving researchers in current and previous phases of CVAP.

The state of the art examples highlight the participatory and

inter-disciplinary approach required among decision-makers, resource systems scientists/analysts, and climate scientists to bring about effective applications.

The book is ideally suited to professionals and postgraduate students in ecology, agricultural climatology, environmental planning, and climate science.

Multi-peril Crop Insurance

A market survey of graingrowers is the next step to progressing a project looking at multi-peril crop insurance. This step in defining commercial viability will be finished this year.

Ernst and Young are coordinating the study which follows on from a preliminary study last year. An early research project by CVAP's predecessor was published as CV 02/95 'Insurance-based Risk Management for Drought'. (Ed)

Weather v Climate

The last issue of *Climag* challenged readers to complete a cartoon caption on: "How come you can predict rainfall a few months ahead, but can't get the weather right for more than a few days ahead?"

A curious range of answers and the winner were posted on <www.cvap.gov.au> under the 'What's New' section for April and May, 2000.

Grant Beard, as the contact for the Bureau of Meteorology's Seasonal Climate Outlook was asked to provide another angle - comparative accuracy. His summary follows.

"There have been exceptional advances in the science and the accuracy of both weather and climate forecasting over the last few decades. For example, four-day weather

forecasts are typically as accurate as one-day forecasts were 20 to 30 years ago. Seasonal climate forecasts are more recent - they've only been around for 10 years in Australia.

"Their reliability varies widely according to location and period of the year, but in general they are at their most accurate in eastern and northern Australia in the second half of the year. This is particularly the case with rainfall outlooks, as the skill of seasonal temperature outlooks is more evenly spread in space and time.

"The accuracy of seasonal outlooks usually increases when there are strong ENSO signals, and is now about comparable with a four or five day weather forecast."

Climate features in rural press

The September edition of *FARMING AHEAD* (with the Kondinin Group) included a special research report - *Climate Risk*. In April, the *Australian Farm Journal* also ran a major feature - *Special Report - Climate*. ●

LWRRDC's R&D newsletters

LWRRDC publishes a number of newsletters which help land, water and vegetation resource managers and researchers share R&D program specific information. These include:

- Intersect* - LWRRDC general newsletter;
- FOCUS* - Dryland salinity program newsletter;
- Climag* - Climate Variability in Agriculture program newsletter;
- RIPRAP* - Riparian land management R&D program newsletter; and
- WaterWheel* - Irrigation R&D program newsletter.

Streamline <www.infoscan.com.au/Streamline> is Australia's natural resource database supported by LWRRDC. To receive the brochure about Streamline, phone Pam Handyside on (02) 6236 6267 or email <pamela@infoscan.com.au>.

To be placed on the mailing list for any of these free newsletters, contact LWRRDC on phone (02) 6257 3379, fax (02) 6257 3420 or email <public@lwrrdc.gov.au> for a Communications Request Form. ●

Getting the odds across

Better communication on the value of seasonal climate forecasts is a challenge for a number of CVAP projects, as reported in this issue and previous issues. Advances in science are not always matched by advances in getting the knowledge across.

Across the Tasman

New Zealand, following recent major droughts, has introduced a seasonal climate outlook. The service is community-based. A team from their National Climate Centre is regularly on the road. First impression on the web site (<www.niwa.cri.nz/ncc/outlook.html>) is the absence of probabilities. Forecasts are in the form average to below average rainfall expected. (Following their improbable experience in the last few minutes of the Bledisloe Cup games, perhaps the Laws of Probability have been repealed across the Tasman.) The website includes a checkpoint which shows how well the forecasts have been performing.

Bookies at Odds

Climatology is not alone when it comes to problems in communicating probabilities. Now the gambling industry thinks it has a problem. Come

December 1, decimal (or tote) odds are in, no more struggling to work out the payout for a \$10 wager at 11-8 on. (\$17, for decimal odds of 1.70). Industry comments on "why the change?" included:

- "to make bookies more attractive" (than a ticket machine?), and
- to replace "imperial" odds which were seen as confusing to younger race goers.

So that 4 to 1 chance will now appear as 5.0, also the payout. (For those who claim to think in probabilities, $Pr=1/Decimal\ Odds$).

The imperial label is probably just slick marketing. Odds based on games of chance using knucklebones as die have been around for a few thousand years. Their replacement with decimal odds is being trailed in Brisbane. Does this reflect greater problems with the imperial odds or better chance of a fair trial for decimal odds?

The change drags reluctant surviving bookies into line with the tote. Interestingly the world's first tote (one of the legendary Australian inventions) was installed in New Zealand in 1913. The mechanical totalisator as used

around the world was invented by George Julius (later Sir George, and first Chair of the then CSIR). The last Julius machine stopped whirring at a London dog track in 1987. (Ed)

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DAD AND DEL

