

Climate Change and Australian Agriculture

Notes for a presentation by Jennifer Marohasy BSc PhD at the Herron Todd White Rural Breakfast Seminar, in Sydney on February 25, 2010

Introduction

ONCE upon a time, when there was drought, communities could only dance or pray in the hope that it would rain. But since the Enlightenment, reason has been advocated as the primary source and legitimacy for authority. Instead of rain dances, some claim we should now be able to rely on infrastructure (e.g. dams and desalination) to mitigate drought and advances in computer simulation modelling to predict drought.

One of the first climate models was built by the Hadley Centre of the UK Met Office. Their model underpins the work of the Intergovernmental Panel on Climate Change (IPCC). To quote from their website: “As one of the world’s leading centres for climate change research, our scientists make significant contributions to peer-reviewed literature and to a variety of climate change reports, including the Assessment Report of the IPCC.” The Australian government’s climate policy is based on the Garnaut Climate Change Review of September 2008 which was based on the work of the IPCC. Indeed the Garnaut Review explains that their team had neither the skills nor resources to re-visit the climate science.

Yet the UK Met Office recently admitted that it predicted temperatures higher than actual temperatures for nine out of the last 10 years and that it is debating what to do with its long-term and seasonal forecasting because they are not accurate. The Met Office predicted this winter would be warmer than average in the UK – yet it was unusually cold.¹ Indeed reading from the UK’s Daily Mail on December 19 they had: “Drivers stranded as heavy snow forces road closures... Misery for commuters as trains are cancelled or delayed... Hundreds of schools close... [And] having been criticised for failing to prepare properly for snow, councils insisted they had been working 'round the clock' to keep traffic moving. But motoring groups fear grit supplies could run out if the bad weather continues.”²

¹ Met Office's debate over longer-term forecasts, by Roger Harrabin, BBC, <http://news.bbc.co.uk/2/hi/science/nature/8462890.stm>

² Blizzard that sliced the country in half, by Chris Brooke and Ray Massey, Daily Mail, <http://www.dailymail.co.uk/news/article-1236859/Flights-cancelled-trains-delayed-roads-closed--Britain-wakes-transport-chaos-heavy-snow-falls-overnight.html#ixzz0fgG7JSLT>

The efficient operation of transport networks, food and energy production requires an understanding of weather for day-to-day operations and climate for medium to long-term planning. But are the institutions that provide us with this information up to the task? My plan is to touch on four key issues today: global temperatures, Australian rainfall, the disjunct between rainfall and runoff in the Murray-Darling, and finally some comments about climate change politics. Perceptions and realities as they relate to these four issues impact on Australian agriculture.

Global Temperatures

CONCERN that the earth is heating up – that global temperatures show an unprecedented increase – has driven the introduction of the Carbon Pollution Reduction Bill/ETS legislation into the Australian Parliament. This potentially represents major structural change to our economy... it doesn't get much more serious.

There are four key official global temperature data sets and there has been much debate and discussion as to which best represents change in global temperature.

I've already mentioned the Hadley Centre (HAD) at the UK Met Office which compiles its data in conjunction with the Climate Research Centre of the University of East Anglia. This group and the Goddard Institute for Space Studies (GISS), part of NASA and based in New York rely on thermometer records. Thermometer data goes back to the 1850s with an increase in the number of stations until the 1970s and then during the 1980s the number of stations used for calculating global surface temperatures was reduced dramatically from about 6,000 to just 1,500 stations – with some claiming that most of the stations that were lost were in the colder regions corresponding in part with the collapse of the Soviet Union.

Satellite temperature data is compiled from NASA satellites by two competing groups both in the USA. The Remote Sensing Systems (RSS) is a business based in Santa Rosa, California, supported by the Earth Science Enterprise program at NASA. The University of Alabama in Huntsville (UAH) also collects processes and publishes temperature data from satellites. Both the satellite data sets only go back to 1979 – when the satellites were launched. The satellite measurements are not calibrated in any way with the global surface-based thermometer record of temperature.

Despite all the arguing, particularly on weblogs, about which is the best data set, looking at just the last twelve years through to mid- 2009, for these four key data sets it is

evident that there is: substantial general agreement between the data sets, substantial short-term variation in global temperature, and no significant rise in global temperatures over this period – to June last year, Figure 1.

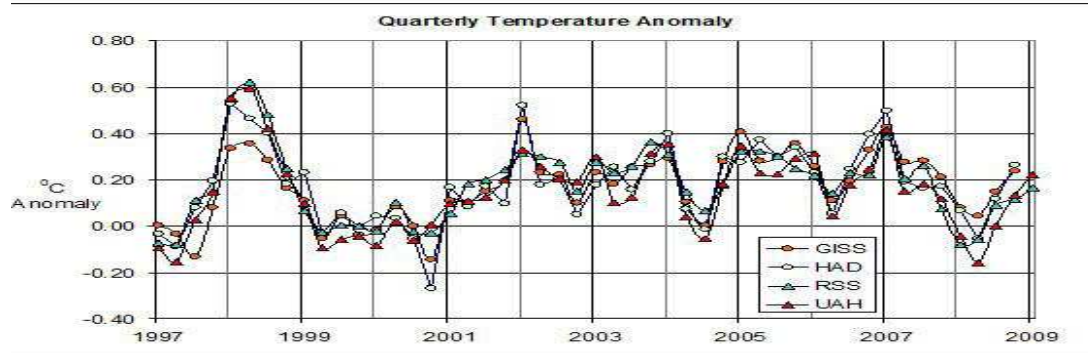


Figure 1. Comparing Global Temperatures by Tom Quirk at <http://jennifermarohasy.com/blog/2009/05/global-temperature-revisited/>. An anomaly is the annual average departure from the average. The Australian Bureau of Meteorology uses 1960 to 1991 as its average.

Arguably the highest quality data is the UAH satellite data available from 1979 to the end of January 2010 (at the time of writing). This data set shows a general warming trend with troughs, including from the Mt Pinatubo volcanic eruption in 1991, and peaks, in particular in 1998 associated with El Niño, and another recent spike in January this year, Figure 2. The January 2010 spike has surprised many particularly given the cold winter in the northern hemisphere.

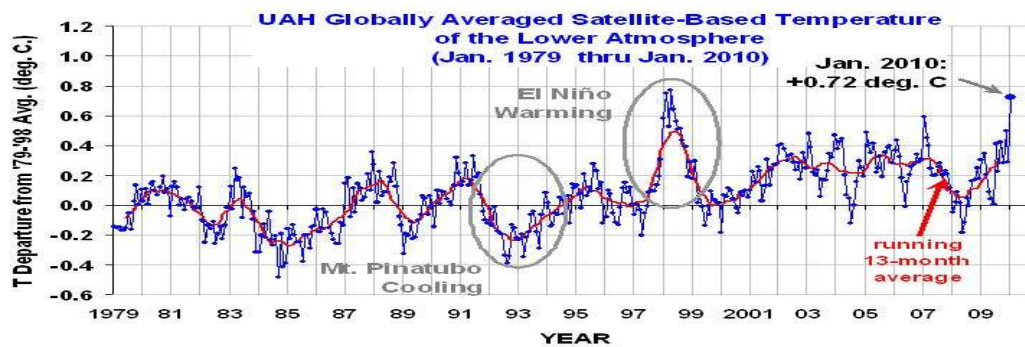


Figure 2. UAH Globally Averaged Satellite-based Temperature of the lower atmosphere, January 1979 to January 2010. For more information see <http://www.drroyspencer.com/>

There were no satellites or thermometers one thousand years ago but temperatures have been reconstructed through the use of what are known as proxies in particular by using the growth patterns in long lived pine trees as indicators of temperature and adjusting for other influences on growth including rainfall.

The first IPCC Assessment report, published in 1990, determined that there was a medieval warm period on the basis of the interpretation of these proxies, Figure 3.

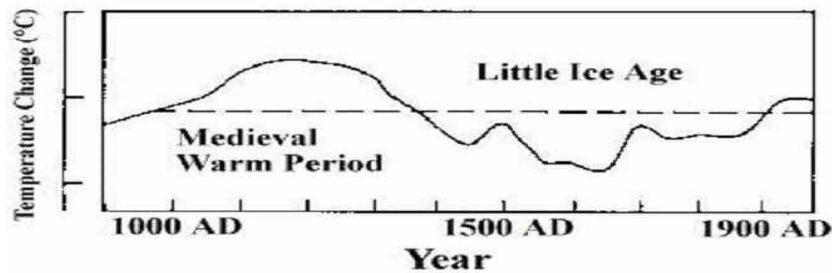


Figure 3. From IPCC 1990.

But the third IPCC Assessment report, released in 2001, determined there was no global warm period during the period AD 800–1300, Figure 4. The new interpretation was based on a new statistical approach to the proxy data in particular by re-modelling of the tree ring data.

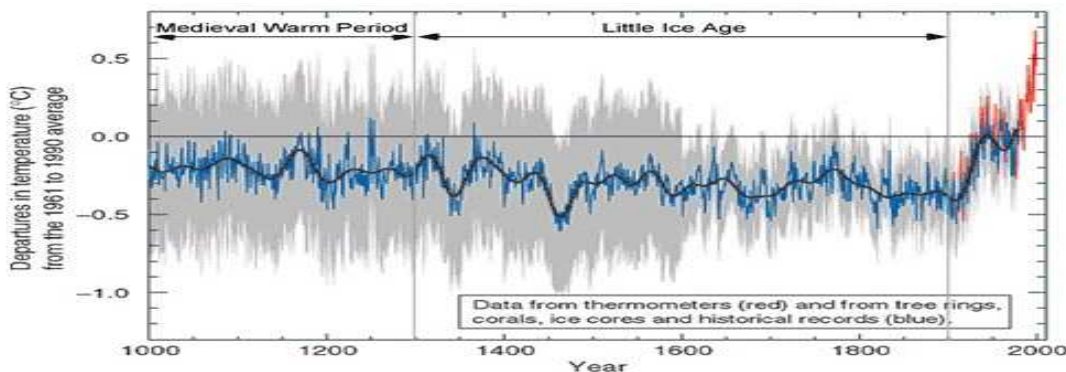


Figure 4. The 'Hockey Stick' graph from IPCC 1998

This new representation of global temperatures was the origin of spectacular claims first by the IPCC, that 1998 was the “warmest” year and the 1990s the “warmest decade” of the millennium. Now it is the basis of claims including by Climate Change Minister Penny Wong that the 12 hottest years in history have all been in the last 13 years.”³

As soon as the third IPCC report was published there were demands from sceptics that the computer code and data used to construct the controversial graph be released for public scrutiny. And it has been shown that slight variations in the statistical methodology used can

³ Climate Change Minister Penny Wong says failure 'not an option' AAP July 16, 2008, <http://www.heraldsun.com.au/news/failure-not-an-option-wong/story-0-1111116931055>

lead to a variety of different results, Figure 5.⁴ Furthermore, it is generally agreed that by removing the tree ring data pertaining to bristlecone pines, it is possible to ‘bring back’ the medieval warm period.⁵ All of this would suggest that the proxies that have been used by the IPCC and extended into Australian climate policy are not a robust or stable indicator of past temperatures.

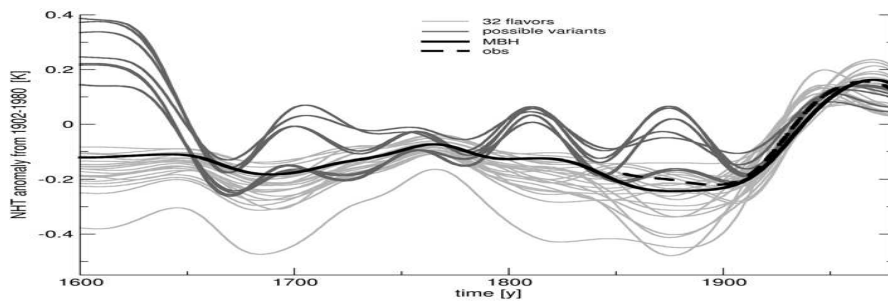


Figure 5. The many different possible representations of global temperature using the same proxy data but varying the statistical treatment/methodology

In November last year, just before Copenhagen, a folder containing documents, source code, data and emails was leaked from the CRU. The emails suggest a culture within the IPCC, and in particular within the CRU and the Hadley Centre, where the most senior scientists use a variety of techniques to support global warming policy including “fudge factors” in their modelling source code, and shortened proxy data series to “hide the decline” in temperatures. In one email Phil Jones, the head of CRU, says he will destroy data rather than comply with an FOI request.⁶ Dr Jones has since been stood down from his position pending the outcome of enquiries into the integrity of these data sources – data sources that form the basis of what most of the western world believes to be unprecedented warming that is likely to lead to a climate crisis unless drastic action is taken to curb greenhouse gas emissions.

⁴ Bürger, G., and U. Cubasch (2005), Are multiproxy climate reconstructions robust?, GRL, 32, L23711, doi:10.1029/2005GL024155

⁵ Presentation to the National Academy of Sciences Expert Panel, “Surface Temperature Reconstructions for the Past 1,000-2,000 Years.” Stephen McIntyre and Ross McKittrick, Washington DC, March 2006, <http://climateaudit.files.wordpress.com/2009/12/nas-mm.pdf>

⁶ The computer code and emails leaked from the CRU at the University of East Anglia can be found here: <http://eastangliaemails.com/emails.php?eid=1036&filename=1254746802.txt>

Interestingly in one of the Climategate emails dated October 14, 2009, Kevin Trenberth head of the Climate Analysis Section at the National Centre for Atmospheric Research in Boulder, Colorado, and a leader author of the last IPCC report, wrote: “We can't account for the lack of warming at the moment and it is a travesty that we can't.”

Australian Rainfall

I'VE never visited the dry lake beds in Mungo National Park, north east of Mildura, in the Murray Darling Basin. According to archaeologists there were seventeen snow-fed lakes each 10 metres deep until 14,000 years ago – snow-fed from the western slopes of the Great Dividing Range. Extinct animals, including giant kangaroos and wombats, have been found at the site. Some say the region has been drying out for 50,000 years - climate changes.

The Stern Review on the Economics of Climate Change is a 700-page report released in October 2006 by economist Nicholas Stern. Commissioned by Tony Blair it is considered the longest and most widely known and discussed report of its kind – even longer than Ross Garnaut's at about 650 pages.

The report received a lot of media here in Australia with both *The Australian* newspaper and national broadcaster, our ABC, quoting from the report that the east coast of Australia has suffered declining rainfall.

Observational data on rainfall for the entire east coast of Australia is available from the Australian Bureau of Meteorology (BOM) with yearly averages back to 1900. But, contrary to the Stern report, this data does not show declining rainfall, Figure 6. It is unclear from the Stern report how it could be concluded we have declining rainfall in eastern Australia unless this is an artefact of the start date of the analysis.⁷

⁷ Interestingly the start date at the BOM site for the rainfall trend maps is 1950 – a relatively wet decade.
http://reg.bom.gov.au/cgi-bin/silo/reg/cli_chg/trendmaps.cgi?variable=rain®ion=aus&season=0112&period=1950

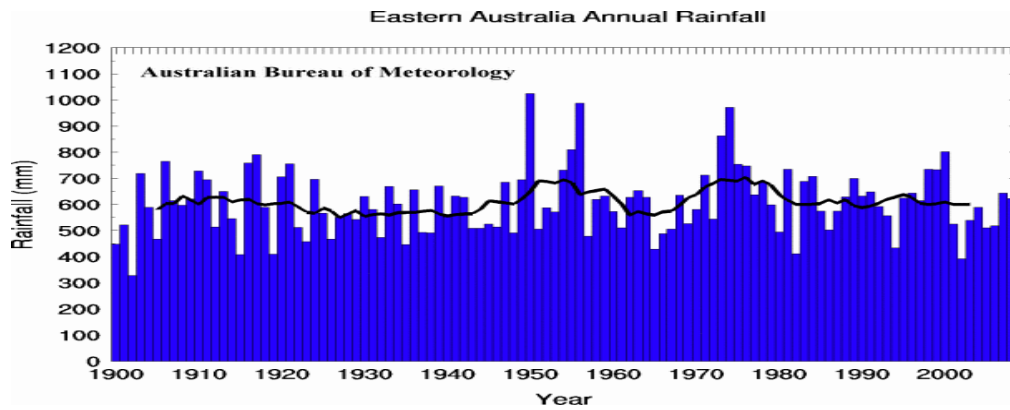


Figure 6. Eastern Australian Annual Rainfall from the Bureau of Meteorology. The black line shows the 11 year rolling average. http://reg.bom.gov.au/cgi-bin/silo/reg/cli_chg/timeseries.cgi?variable=rain®ion=eaus&season=0112

Rainfall data for the Murray-Darling Basin is also available from BOM. Again we see peaks and troughs but no general overall decline in annual average rainfall, Figure 7.

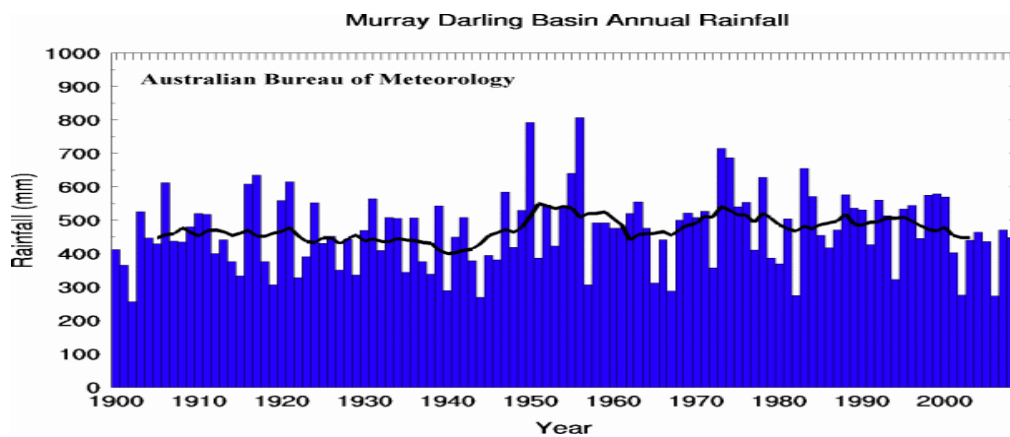


Figure 7. Annual Rainfall Murray Darling Basin. http://reg.bom.gov.au/cgi-bin/silo/reg/cli_chg/timeseries.cgi?variable=rain®ion=mdb&season=0112

BOM have also calculated the annual average departure from the average rainfall (the anomaly) together with the 11-year average plotted on the 6th year of the averaging period for the Murray-Darling Basin. This chart indicates that the recent dry period is not yet as dry as the period from about 1935 through 1945 or the Federation drought, Figure 8.

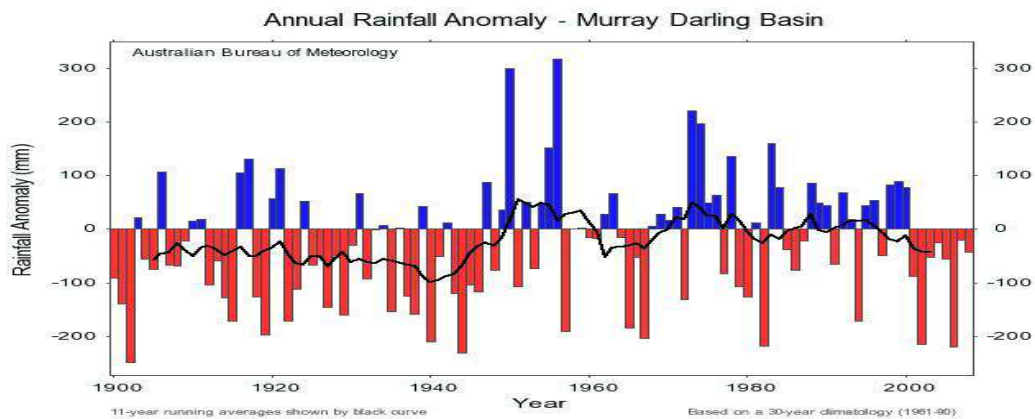


Figure 8. Annual Rainfall Anomaly.

Farmers have been saying the region has never been so dry. It rained less during the first half of the 20th century than the second half but most farmers were not alive back then.

There was above average rainfall in upper catchment areas in late December 2009 and widespread flooding in western New South Wales. This good recent rain may signify a change, back to wetter conditions, then again it may just represent a blip in an otherwise drying cycle. There is no reliable long range theory for predicting or modelling regional rainfall.

In summary, there is no climate crisis and there is no reason to be concerned about rainfall and temperatures in Australia beyond the fact that climate will continue to be variable – remember we live in a land of drought and flooding rains.

But the doomsayers will continue to try and panic us. Indeed in one of the Climategate emails a request is made by Adam Markham, then International Climate Campaign Director at the World Wildlife Fund (WWF), to Mike Hulme at the CRU, that he “beef-up” a section of a report on drought and extreme weather to provide ammunition to Australian scientists at the CSIRO in support of a planned “big public splash” on the issue by WWF-Australia.

Water Availability in the Murray-Darling

ON July 15, 2008, the day before Australia’s Minister for Climate Change and Water, Penny Wong, released the Green Paper on the Carbon Pollution Reduction Scheme (based on the recommendations in the Garnaut Report) the Minister and Prime Minister visited Lake Hume and highlighted CSIRO research claiming that climate change is affecting water availability

in the Murray River faster than anticipated.⁸ The Prime Minister said inflows into the Murray in the past 10 years are lower than the best-case climate change predictions. And then went on to explain that tackling the problems in the Murray-Darling Basin required serious action on climate change best achieved through emissions trading.

The visit and comment got lots of publicity. But the very low inflows over the last 10 years can be better explained with respect to government policies affecting land and water management – the data shows no correlation with the rising levels of atmospheric carbon dioxide.

Some years ago the Western Australian Water Corporation calculated that low inflows into Perth's dams were caused by more trees and that by reintroducing a policy of thinning as much water could be saved as would be generated by the proposed desalination plant. The WA government has since completed the desalination plant, but I understand is still undertaking an extensive community and stakeholder consultation process on the potential ecological impact of thinning.

The Murray Darling Basin Commission estimate that regrowth from the bushfires in early 2003 could reduce run-off into the Murray by 430 gegalitres per annum by 2020 and that new plantations could further reduce runoff by a whopping 1,100-1,400 gegalitres.

And yet the new leader of the Opposition, Tony Abbot, has suggested we can solve the problems of the basin by planting more trees – and a Commonwealth takeover.

There seems little understanding of just how many more trees there are now along much of the Murray than there were one hundred years ago. Indeed as the following photograph of Swan Hill in 1896 shows, the early settlers cleared right along the river bank, Photograph 1. Much of this region is now National Park, or soon to be declared National Park, and as you can see from the photograph taken from the same place in 1996 there are a lot more trees.

⁸ Rudd and Wong climate change visit, by Rob Harris,
<http://www.abc.net.au/local/stories/2008/07/15/2304121.htm>



Picture 1. The Murray River at Swan Hill 1896 from Roy Threadgold



Picture 2. The Murray River at Swan Hill 1996, Taken by Roy Threadgold

Low river inflows have also been exacerbated by groundwater pumping and more farm dams. I visited Cubbie Station in May 2006 and saw how extensive their water diversion and storage capacity is, Photograph 3. I've also visited the Macquarie Marshes and seen water being ingeniously and illegally diverted for grazing. On the banks of Lake Alexandria near the Coorong there are new vineyards and housing estates. Then of course there are new coal mines with a guaranteed water allocation, the north-south pipeline being built to take water from the Murray Darling to Melbourne... and the list of demands on the system goes on and on.



Photograph 3. Jennifer Marohasy standing on the banks of a channel at Cubbie Station, May 2006

To solve the problems of the Murray Darling Mr Abbott would need to unwind 100 years of unrealistic expectations. But the Australian community would still be unhappy. Consider that in August 2006 it was reported by our ABC that water levels in the River Murray were at historic lows.⁹ In fact, despite the drought and low inflows, the Murray River was running strongly with about 4.1 gigalitres of water passing Riversdale each day. Riversdale is a farm just downstream of Barham in the central Murray Valley, Photograph 4. Local farmer, Daryl McDonald, remarked: "Quite amazing considering we have had the lowest inflows on record. It should be noted that South Australia still expects its guaranteed 1,850 gigalitres per annum, while NSW irrigators have a zero allocation, and the Victorians are on 50 percent of their average 160 percent Water Right."

Before the Hume and Dartmouth dams were built, the River did run dry during periods of drought, Photograph 5. According to Marianne Cockroft quoting Russel McDonald who lived at Riversdale: "Water was never more than two feet six deep while we carted [timber], and for a long time in Autumn 1915 was perfectly dry, the river having stopped running in February or March".¹⁰

⁹ "The water level in the Murray River is at its lowest since records began more than 100 years ago." ABC News Online, Murray River flows at record low, August 17, 2006

¹⁰ '100 Years at Rosevale' by Russell McDonald in 'Picnic in the Murray in Defiance of the Drought' by Marianne Cockroft



Photographs 5 and 6 taken at Riversdale, Central Murray Valley, in 2006 when the ABC was reporting the Murray at a record low level and in 1915 when the river was dry.

Not so many years ago the Australian community was frightened by reports that large tracts of land would be lost to salt.¹¹ We were told that the rich farming lands of the New South Wales Riverina would be destroyed by rising ground water.

Depth of the watertable is an indicator of salinity. Less than 2 per cent of the Riverina ended up being affected by shallow water tables, Figure 9.

Some of this great news can be attributed to the dry years, but even before the drought, groundwater levels in the Murray, Murrumbidgee and Coleambally irrigation areas - the regions considered most at risk in eastern Australia - were falling.

They were rising in the 1970s but falling in the 1990s. The general fall in groundwater levels is in large part a consequence of landholders and the Murray Darling Basin Commission putting in place a sophisticated drainage management plan including salt interception designed to evaporate water while collecting salt.

The focus, even during the recent drought, has been on evaporating water and this activity no doubt continues to cause parts of the environment to become artificially dehydrated.

There is much government could do to reduce water wastage in the Murray Darling Basin beginning with an audit of its many salt interception schemes and drainage management plan to check that all the water being evaporated is worth its salt!

Indeed this would be much more useful than suggesting, as Minister Wong has, that by paying more for our electricity we can make it rain on the Murray Darling, and that there will then be more water for farmers and the environment – such statements are plain wrong.

¹¹ Monitoring the white death – soil salinity, <http://www.science.org.au/nova/032/032key.htm>

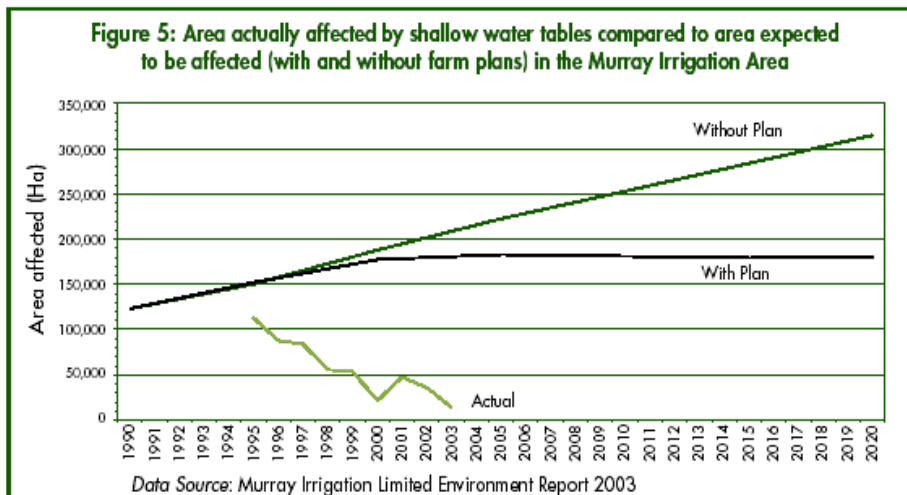


Figure 9. Actual area affected by shallow water tables compared to area expected to be affected. Murray Irrigation Sustainability Report 2003. The 2005 report shows the area affected had stabilized at about 8,000 hectares in March and 3,000 hectares in August. <http://www.murrayirrigation.com.au/download/3258576.pdf>

Environmental Politics

TOWARDS the end of last year, just before the Australian Parliament was due to vote on the Carbon Pollution Reduction bill/the ETS I received a copy of a new book by Christopher Booker entitled ‘The Real Global Warming Disaster: Is the obsession with climate change turning out to be the most costly scientific blunder in history?’ (Continuum 2009) and it began: “This book tells the story of what has been, scientifically and politically, one of the strangest episodes of our time. Indeed, as a case study in collective human psychology, it is turning out to have been one of the most extraordinary chapters in the history of our species.”

Then just when it looked like we were sure to have an ETS thrust upon us all the same, Tony Abbot challenged Malcolm Turnbull on this very issue and the politics has changed.

According to a recent Newspan survey, opposition in Australia is growing to the proposed emissions trading scheme (ETS), although Australians overwhelmingly want action on climate change¹².

A jump in public support for action on climate change in 2006 followed the release of the movie *An Inconvenient Truth*. According to the film’s website: “It is by far the most terrifying film you will ever see”, and “What changed in the US with hurricane Katrina was a

¹² Newspan: Rudd hits a new low, The Australian, Feb 16, <http://www.theaustralian.com.au/news/newspan-rudd-hits-a-new-low/story-e6frg6n6-1225830702740>

feeling we have entered a period of consequences.” The film went on to win an academy award and the Nobel Peace Prize for former US Vice President Al Gore.

In Australia in 2006 capital city dams were low and we were in the middle of a run of years with below average rainfall in the Murray Darling Basin... Al Gore’s warnings resonated. But they won’t into the future if we continue to get a few seasons of reasonable rainfall and next winter is unusually cold again in Washington, Berlin and London.

I heard Ross Garnaut on ABC television last week suggesting an international framework for emissions trading was inevitable. But he provided no evidence in support of this opinion. Indeed, it is unlikely the US will now pass its Cap and Trade Bill¹³ and the Chinese have absolutely no intentions of imposing a price on carbon. Earlier this month the Indian government announced the creation of its own Indian Network on Comprehensive Climate Change Assessment (INCCCA) on the basis it can no longer rely on the IPCC. The Indian environment minister, Mr Jairam Ramesh, commented at the time that the IPCC does not do original research and that there is a fine line between climate science and climate evangelism.

The British media, unlike the Australia media, is continuing to publish much about the Climategate scandal. Of course the conduct of a group of climate scientists, however wrong and offensive, does not necessarily prove or disprove global warming. But it does reflect on the quality of the science being used to justify major structural changes to national economies. Indeed there is some evidence to suggest the wheels are starting to fall off the global warming bandwagon in Europe.

In summary Australian agriculture has much to fear from a national emission’s trading system, and nothing to gain. The suggestion that Australian agriculture will somehow be disadvantaged and alone if it is not included in an Australian ETS is nonsense. And it is extremely unlikely our major trading partners will end up with a carbon trading scheme

Those in the business of agriculture would, however, benefit from better weather and climate forecasts. Whether it rains or not has a real and immediate financial consequence. Australian farmers must take the weather and climate seriously, but they would be wrong if

¹³ The Waxman-Markey Cap-and-Trade Bill appears to be politically dead since Republican Scott Brown's paradigm-shattering Massachusetts Senate victory. But alternative proposals being floated by Senator Byron Dorgan (D-ND) and others still promise billions of dollars to wind developers and commit the United States to generate as much as 20% of its electricity from so-called "renewable" sources.

they assumed the work/the forecasts of key publicly funded agencies and institutions and their overseas collaborators had not been significantly compromised by the politics of global warming. And unfortunately, as a consequence, perception and reality are badly mismatched, and public policy on this important issue has become seriously bogged-down. I see no



obvious way clear.

Thank you.

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