PROCEEDINGS

Australian
Farm Institute

Agriculture, Greenhouse and Emissions Trading Conference

Novotel Twin Waters Resort, Maroochydore

6 and 7 May 2009

Summit sponsor:
The National Climate Change Research Strategy for Primary Industries (CCRSPI)

ISBN 978-0-9806912-8-3 (Web)
ISBN 978-0-9806912-7-6 (Print)

Australia's Independent
Farm Policy Research Institute

The Australian Farm Institute

The Australian Farm Institute is an agricultural policy research organisation that has been established to develop and promote public policies that maximise the opportunity for Australian farmers to operate their businesses in a profitable and sustainable manner.

To do this, the Institute carries out or contracts leading academics and consultants to conduct research into farm policy issues that the Institute's Research Advisory Committee has identified as being of high strategic importance for Australian farmers. The Institute has a commitment to ensuring research findings are the conclusion of high quality, rigorous and objective analysis. The Australian Farm Institute promotes the outcomes of the research to policy-makers and the wider community.

The Australian Farm Institute Limited is incorporated as a company limited by guarantee and commenced operations on 23 March 2004. The Institute is governed by a Board of Directors who determine the strategic direction for the Institute. The Institute utilises funding voluntarily contributed by individuals and corporations to perform its activities. Initial seed funding has been contributed by the NSW Farmers' Association.

Vision

Farm policies that maximise the opportunity for Australian farmers to operate their businesses in a profitable and sustainable manner.

Objective

To enhance the economic and social well-being of farmers and the agricultural sector in Australia by conducting highly credible public policy research, and promoting the outcomes to policy-makers and the wider community.

Membership/Subscriptions

The Australian Farm Institute has a wide range of Membership and Publication Subscription alternatives that meet the requirements of individuals, corporate organisations, libraries and small business:

- Corporate Membership
- Individual Membership
- Student Membership
- Journal Subscription
- Institutional Subscription

For further information please contact the Institute on **61 2 9690 1388** or via email **info@farminstitute.org.au** or alternatively visit **www.farminstitute.org.au/memberships**

Publications

The Institute publishes a variety of publications, including a quarterly *Farm Policy Journal* (see inside back cover), research reports, papers, newsletters and media articles.

AGET 2009 Conference Sponsor: **CCRSPI**

The National Climate Change Research Strategy for Primary Industries (CCRSPI) is a joint initiative of all the rural research and development corporations, state and territory governments; the Australian Government Department of Agriculture, Fisheries and Forestry; and the CSIRO. CCRSPI is managed by Land & Water Australia. CCRSPI is founded on primary industries collaborating, coordinating and communicating with each other so that information can be shared, knowledge generated and responses developed to deal with climate change. Australia's climate and ecological realities give a real imperative to the CCRSPI initiative as it will help primary industries to identify and realise innovations that prepare for, and enable farmers and the communities that depend on them to adapt to climate change.

For more information about CCRSPI – **www.lwa.gov.au/ccrspi**

To obtain hard copies of Institute publications, contact the Institute on (02) 9690 1388, email info@farminstitute.org.au or visit www.farminstitute.org.au/publications

Australian
Farm Institute

Agriculture, Greenhouse and Emissions Trading Conference

Novotel Twin Waters Resort, Maroochydore

6 and 7 May 2009

Summit sponsor:

The Climate Change Research Strategy for Primary Industries

ISBN 978-0-9806912-7-6 (Print)
ISBN 978-0-9806912-8-3 (Web)

Australian Farm Institute Limited

Suite 73, 61 Marlborough Street
Surry Hills NSW 2010
AUSTRALIA
ABN 29 107 483 661
T: 61 2 9690 1388
F: 61 2 9699 7270
E: info@farminstitute.org.au
W: www.farminstitute.org.au

Disclaimer

The material in this Report is provided for information only. At the time of publication, information provided is considered to be true and correct. Changes in circumstances after publication may impact on the accuracy of this information. To the maximum extent permitted by law, the Australian Farm Institute disclaims all liability for any loss, damage, expense and/costs incurred by any person arising from the use of information contained in this Report.

Publication Data

Australian Farm Institute 2009, *Agriculture, Greenhouse and Emissions Trading Conference*, Australian Farm Institute, Surry Hills, Australia.

Design and Production: Australian Farm Institute

Printing: J.A. Wales Printers, Alexandria

Contents

Contents iii
List of Figures and Tables iv

Conference Welcome
John Keniry 1

The Australian Government's Carbon Pollution Reduction Scheme, and the Role of Agriculture
Anthea Harris 3

Some Economic Implications of the CPRS for Australian Agriculture
David Pearce 11

Panel Session: Anthea Harris & David Pearce 19

The Impact of the CPRS on the Energy Sector
Paul Balfe 27

Implications of the CPRS for Australian Meat and Dairy Processors
Robert Poole 36

Panel Session: Paul Balfe & Robert Poole 41

Emission Accounting: What are the International Rules Applicable to Agriculture?
Ian Carruthers 43

The Views of the Environment Sector Concerning Australia's CPRS and the Role of Agriculture
Paul Toni 49

Panel Session: Ian Curruthers & Paul Toni 54

Sequestration Options: The Future Role of Carbon Sink Forests Under the CPRS
Richard Stanton 57

Agricultural Sequestration and Mitigations: What are the Realistic Options for Ruminant Livestock?
Roger Hegarty 64

Agricultural Sequestration and Mitigation Options: What are the Realistic Options for Soil Sequestration?
Evelyn Krull 70

Panel Session: Richard Stanton, Roger Hegarty & Evelyn Krull 78

How Can Agriculture be Included in an Emissions Trading Scheme? Some Thoughts from New Zealand
Suzi Kerr 80

The 'Point of Obligation' Question: Should Processors or Farmers be Made Responsible for Farm-Level Emissions in Australia?
Tom Maguire 87

Panel Session: Suzi Kerr & Tom Maguire 92

The Voluntary Soil Carbon Market in the USA. Is this a Viable Model for Australia?
David Miller 95

Panel Session: David Miller & farmer representatives 102

Concluding Comments
Mick Keogh 105

List of Figures and Tables

Harris	Figure 1:	Australian greenhouse emissions by economic sector. 5
	Figure 2:	Sources of Australian agricultural emissions. 9
Pearce	Figure 1:	Linkages between economic models used in CPRS analysis....12
	Figure 2:	Projected impact of the CPRS on 'average' farms, $25 emission price (top) and $50 emission price (bottom)....13
	Figure 3:	Share of farm cost increase due to emission permit costs....14
	Figure 4:	Changes in farm cash income. 15
	Figure 5:	CPRS impacts under different permit allocation scenarios ($25/tonne permit price)....15
	Figure 6:	Proportion of total farm receipts and emissions from livestock and crops. 16
	Figure 7:	Cost of sequestering accounting for risk. 17
Balfe	Figure 1:	Impact of 20 per cent target – 60,000GWh; new renewables target 35,500GWh. 28
	Figure 2:	CO_2 emissions for conventional thermal generation technology. 29
	Figure 3:	Overview of ESAA modelling methodology. 30
	Table 1:	Wholesale electricity price changes resulting from CRPS ($/MWh). 31
	Figure 4:	Modelled emissions permit prices (real $2008). 31
	Figure 5:	Generator capacity retirement and growth, 10 per cent emission reduction scenario....32
	Table 2:	Indicative pass through to retail tariffs (cents per kWh). 32
	Figure 6:	Generator capacity retirement and growth, 20% emission reduction scenario. 33
	Figure 7:	Projected changes in the mix of generator capacity over time....34
	Figure 8:	Fuel sources for electricity generation. 34
	Figure 10:	Projected changes in gas prices over time....35
Carruthers	Figure 1:	Carbon account of Australian crop lands. 45
	Figure 2:	Implications of including Article 3.4 items in Australian greenhouse inventory. 46
Stanton	Figure 1:	Plantation carbon profile over time. 60
	Figure 2:	Plantation Expansion in Australia since 1950. 62
	Table 1:	ABARE/Treasury Modelling – reforestation '000 ha by 2050. 62
Hegarty	Figure 1:	Sources of Australian Livestock Emissions: Over 95 per cent of animal emissions are from grazing livestock....65
	Figure 2:	Options to reduce livestock emissions. 66
Krull	Table 1:	Estimates of the size of different global pools of carbon. 70
	Figure 1:	Soil carbon profiles of different Australian soil types. 71
	Figure 2:	Changes in soil organic carbon fractions under different management. 72
	Figure 3:	The biochar production process. 73
	Figure 4:	Process for plantation production of Mallee trees....74
	Figure 5:	Mitigation benefits of different biochar options....75
	Figure 6:	Factors contributing to greenhouse emission mitigation utilising biochar....76
Kerr	Figure 1:	Agricultural emission reduction possibilities, New Zealand. 82
Milller	Figure 1:	US Land Resource Regions, based on soil types. 98

Conference Welcome

John Keniry

Director, Australian Farm Institute

John Keniry is Chairman of Ridley Corporation Limited and the Cooperative Research Centre for Sheep Industry Innovation. Previously, John was Chairman of a Regional Business Development Analysis Panel, Australian Biodiesel Group Limited and WoolPoll 2006. He has been the Chair or a participant in a range of Commonwealth Government inquiries, including inquiries into regional development, livestock exports and biofuels. He is the owner of a wool growing and cropping enterprise based in the central west of NSW. John has been a member of the Board of the Australian Farm Institute since July 2004.

Firstly, it is my great pleasure to say to everybody here a very warm welcome and to thank you all for coming. We are looking forward to everybody's active participation in the Conference, so I'm encouraging everybody, not just in the discussion sessions, but in the sessions after the presentations, to please let us have your ideas and make any comments and I think that way we will all get the best out of the Conference.

Last year our Conference brought together people from many facets of agriculture and it resulted in a focus on the possible impact of emissions trading and greenhouse generally on agriculture, probably for the first time in a forum that involved a wide cross-section of agriculture sector representatives. This year's program is a logical extension of last year's conference. The Government's White Paper outlining the preferred design of the scheme has now been released; the exposure draft Carbon Pollution Reduction Scheme Bill has been introduced to Parliament; the Senate is conducting several inquiries into the issue, and Australian agriculture is now engaged in debate about the role of the sector in the Scheme.

On the world stage the global financial crisis has changed the focus of many governments which are struggling with economic and political challenges that did not exist twelve months ago, and this might be interpreted to mean the momentum of climate change policy has slowed. However, a new President of the United States has heralded a new era of US engagement with the international community, especially in relation to climate change policy. This suggests that there is some renewed expectation of a global agreement being reached at the climate change negotiations scheduled for Copenhagen in December, 2009.

I think the reality that Australian agriculture needs to face is that the world's scientists are overwhelmingly convinced that global warming is happening and that mankind is contributing to global warming. More importantly I think, the world's population has got the message and they think global warming is happening and is being caused by human activities and there doesn't seem to be much doubt in consumer surveys all round the world that people are generally expecting their leaders to take some action on this issue.

I think Australian agriculture has to progress in the belief that decisions based on good science are most likely to be the best decision. I think we need more scientific research on greenhouse emissions and

agriculture. But I think we've also got to recognise in the Conference today and in the general positions we take in the agriculture sector, that from time to time a lot of decisions get made on the basis of economics and politics and much less on the science. If we look at what has transpired with Australia's emissions trading scheme and the recent changes made, then I suspect politics has been about 90 per cent of the driver, economics the other 10 per cent; and I doubt that science is on a page anywhere. I think that's a lesson for us. We can't focus only on the science, we've got to look at the broader economic and policy issues because that's what all the other emissions trading participants – some of whom are potential beneficiaries and some of whom will be disadvantaged – are focusing on.

Over the next few days I think this conference needs to consider what the implications of the CPRS for agriculture will be; what the agriculture sector's position in relation to the CPRS should be; and what the sector should be doing to minimise the impact of the emissions trading scheme. At the same time, we need to keep in mind the need for Australian agriculture to find ways to adapt to climate change, as well as its associated policies.

The Australian Government's Carbon Pollution Reduction Scheme, and the Role of Agriculture

Anthea Harris

Assistant Secretary, Department of Climate Change

Anthea Harris is an Assistant Secretary with the Department of Climate Change, leading the Carbon Market Linkages Branch, contributing to both the Government's Green and White Papers on the Carbon Pollution Reduction Scheme. Anthea formerly led the Secretariat supporting the work of the Australian states' and territories' National Emissions Trading Taskforce. Previously, Anthea was a consultant, where she worked on a range of greenhouse policy issues, including assisting the NSW Government design and implement its Greenhouse Gas Abatement Scheme.

The basic architecture of the Carbon Pollution Reduction Scheme (CPRS) has been set out in the White Paper. Some significant changes to the CPRS were announced recently; I'll talk to you about what they are and some implications of these changes for agriculture.

First of all, it's always worth reminding ourselves of why we are here at all, why we are talking about these things and why the Government's decided to introduce policies to help reduce greenhouse gas emissions. The reason is it's in Australia's interest to have global action on greenhouse gas emissions because we know that among developed countries, Australia will be one of the first and hardest hit by the impacts of climate change. We also know that if we are going to take action, taking it sooner rather than later will help to reduce those costs and it means that we may have a smoother transmission to a low carbon future.

There's also a need to reduce investment uncertainties. For example in industries such as electricity generation, people have for years been recognising that we need new base-load power generation capacity, but have been very uncertain what sort of power station should be built. The main choices are between gas and coal-fired generators, but which of these is preferred depends heavily on whether Australia is going to have a carbon price in the future and what that carbon price might be. Given that these are multi-million dollar investments with fifty-year life cycles, there are obviously very significant business issues associated with not knowing what the rules are going to be.

It is also important to recognise that it will be very difficult for Australia to persuade other nations, and especially developing nations, to take action to limit greenhouse gas emissions unless we are willing to take action in our own country. This is quite important, as it is obvious that global action will be the only way to effectively reduce greenhouse gas concentrations in the atmosphere.

When talking to people about the Australian CPRS, I often hear the comment that the Scheme seems to have suddenly appeared out of the blue, but that's actually not the case. There's been work going on in this policy area for over a decade. If you look back to the late 1990s the Australian Greenhouse Office was publishing papers discussing what an emissions trading scheme might look like. Then the states and territories formed the National Emissions Trading Taskforce, and published a number of reports about what a scheme could look like. The previous Australian Government set up its own task group on emissions trading, which also recommended establishing a scheme. The Rudd Government made

a commitment to introduce a scheme prior to the last election. Since then, there has been a Green Paper released, followed by extensive Treasury modelling and finally a White Paper detailing the Government's preferred design. More recently, exposure draft legislation was released for public comment. This all highlights that there has been a lot of work going on associated with this policy issue for a long time.

Before I get into the exact details of how the CPRS works, I want to talk to you very briefly about what exactly a cap and trade emissions trading scheme is. It's fair to say that there's still some misunderstanding about how a scheme such as this will operate. The main thing to know about a cap and trade emissions trading scheme is there are two important elements to it. The first important element is that there is a cap or upper limit imposed on emissions that can be produced by those businesses that are required to participate in the scheme. This cap declines over time and forces these businesses (through higher costs) to reduce the greenhouse emissions they produce.

The cap is set collectively for all the emissions produced by businesses that are required to participate in the scheme. There is no cap set for individual sectors of the economy, and there are certainly no emission caps set for individual specific activities or individual companies. Then the Government issues emission permits up to the limit of that cap. Some of these permits will be made available free to eligible businesses, but most will be auctioned by the Government.

Businesses that are required to participate in the scheme (liable parties) need to obtain sufficient permits to match their total emissions, with each permit covering one tonne of emissions. These permits will be surrendered at the end of the year, when that business submits its annual greenhouse emission statement. The cost involved in obtaining these permits becomes a cost of production, so like any scarce resource – for example good land or skilled labour – there will be many businesses competing for these permits and that will give them a price; what is often referred to as the carbon price. This carbon price is very important. This carbon price is what does all the work. If a business has to factor it in to its cost of production and therefore its business decisions, it means it will influence decisions about what to invest in, what to produce and what consumers will choose to buy.

The main objective in implementing a CPRS is to reduce emissions in line with a long-term national target. The Government has previously announced that its target is to achieve emission reductions of between 5 and 15 per cent of 2000 emission levels by 2020. The 5 per cent is an unconditional commitment, so regardless of what the rest of the world would do, Australia is committing to reducing its national emissions by 5 per cent of 2000 levels by 2020. Australia will commit to a 15 per cent emission reduction target if all major economies commit to substantially restraining their emissions and advanced economies take on reductions comparable to Australia. The Government has also recently announced that under special circumstances where a very strong international agreement has been agreed and some other conditions have been met, then Australia would agree to adopt a target to reduce emissions by 25 per cent compared with 2000 level emissions by 2020. This 25 per cent target requires an international agreement that is very strong and includes a number of factors relating to developed country commitments, developing country commitments, the year in which emissions are likely to peak and also that the international community commits to stabilising global greenhouse emissions at 450 parts per million or less.

I now want to talk a little more about the specifics of the design of the Australian CPRS. The first thing you need to do in designing a scheme such as the CPRS is to decide which emissions the scheme will actually cover. There are millions of individual sources of greenhouse emissions in the Australian economy, ranging in size from a motor vehicle to a coal-fired electricity generator. It is not logistically feasible nor administratively efficient to try to include every single source of emissions in the CPRS, therefore decisions are needed about what sectors of the economy should be included, and also the size of the individual sources of emissions that should be included.

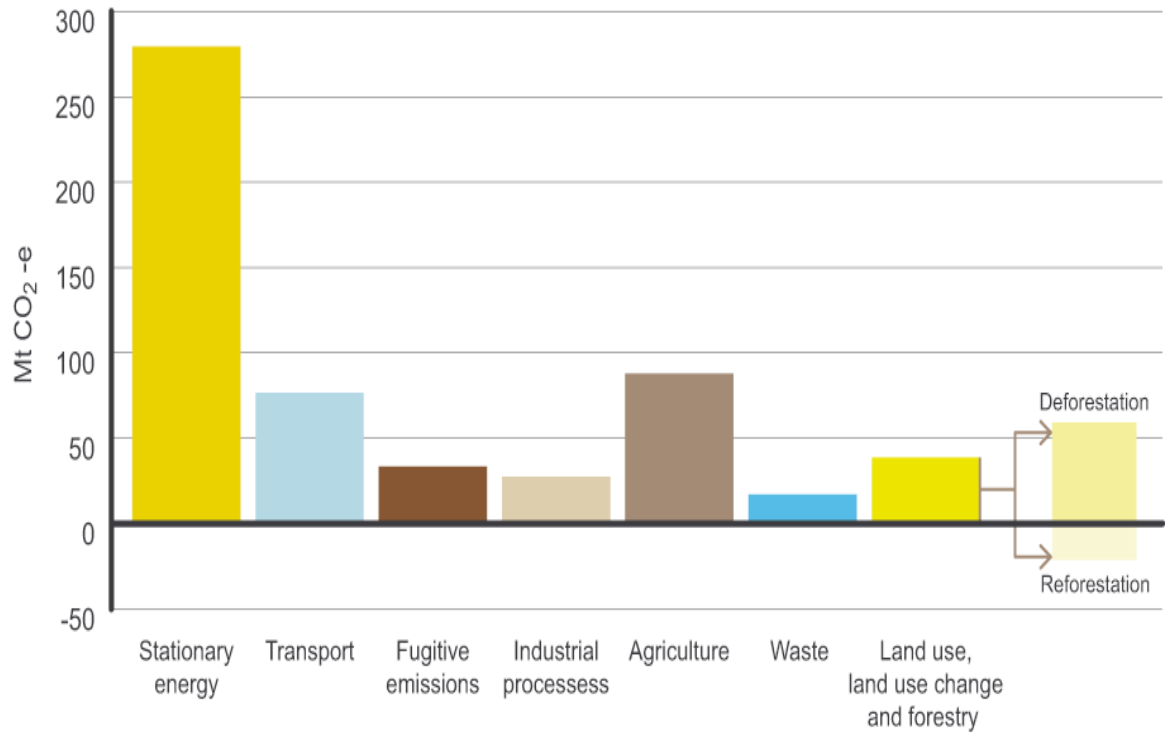


Figure 1: Australian greenhouse emissions by economic sector.

For this reason the Government has identified specific sectors of the economy that will be 'covered' by the CPRS, and has also set a minimum threshold of 25,000 tonnes of emissions for businesses that will be required to participate in the scheme. Based on the decisions made to date, about 75 per cent of Australia's annual emissions will be covered under the CPRS from day one. Figure 1 identifies that the stationary energy sector accounts for about half of Australia's national emissions, and about two thirds of those emissions (35 per cent of national emissions) come from the electricity generation sector. All those emissions will be included in the scheme from day one. The transport sector is also a major source of emissions as can be seen from Figure 1. Again, all those emissions will be covered from day one. However rather than making all individual motorists liable for the emissions associated with the fuel they use – which is clearly not very administratively efficient – upstream fuel suppliers will be made liable on their behalf. This means that when major fuel companies sell fuel, they incur an obligation for the emissions that we create when we burn that fuel in our motor vehicles.

Fugitive emissions, which are emissions from coal mines or gas production, are also included in the scheme from day one. Emissions from industrial processes, which include the creation of clinker to go into cement or in the production of steel are also included in the CPRS from its commencement.

Agriculture is the source of about 16 per cent of national emissions, but the sector will not be included in the scheme initially, and a decision won't be made about the potential inclusion of the sector until 2013.

Emissions from the Waste sector will be included in the Scheme. This is mainly emissions from landfills, although there are also emissions from the wastewater produced by businesses such as meat processing facilities. In relation to Land Use, Land-Use Change and Forestry, deforestation emissions (or emissions resulting from land clearing) will not be included in the Scheme. We note that Australia's emissions from deforestation have reduced significantly since 1990, which was mostly been achieved through state-government land clearing regulation.

Reforestation (which refers to planting and growing trees on eligible land) results in the removal of greenhouse gases from the atmosphere and sequestering or locking them up in wood. Businesses involved in reforestation will be able to decide voluntarily whether they wish to be included in the CPRS. A forestry business can decide to participate in the CPRS and earn emission permits for every tonne of greenhouse gas locked up by that forest, however if those trees are subsequently chopped down and not replanted, that business will incur an emissions liability and have to obtain and surrender emission permits to the Government.

After a decision is made about which emissions are going to be covered in the Scheme, the next step is to set emission caps. In making decisions about an emission cap, there is also a need to think about how long in advance to announce these caps. The Government has announced that liable parties will have five years' notice of the emission cap that will be set for each year. Then as further guidance, the Government has also said it will announce the range within which caps will be set for the years between five and ten years in the future. These are being referred to a 'gateways', and mean that businesses will not know the actual caps for these future years, but they will know well in advance what the maximum and minimum possible cap for each of those years will be.

The Government has recently announced some very important changes to the CPRS relating to transitional arrangements. The first change is that mandatory obligations under the Scheme have been deferred for one year, so the scheme is now scheduled to commence on 1 July 2011. The only exception to this is forestry, and owners of forestry businesses can opt in to the CPRS voluntarily from 1 July 2010. The other transitional measure announced is that in the first year of mandatory obligations – the 2011–2012 financial year – there will be a fixed price for emission permits of $10. This means that it won't be the market determining the price of permits for the first twelve months – there will be an unlimited supply of 2012 vintage permits made available at a fixed price of $10. After the first year the price of emission permits will be set by supply and demand, although there will initially be a maximum price set as a risk-management measure to prevent extreme permit prices.

As I noted earlier, once a decision has been made on the cap that will apply for a particular year, the next step is to issue the required number of permits. If the cap was 100 tonnes of emissions, the Government will issue 100 permits. These permits are called Australian Emissions Units or AEUs. Each permit allows the emission of one tonne of greenhouse emissions. The permits will have the same status as personal property. What that means is if a business has purchased some of these AEUs at auction, then the Government can't just cancel them without paying full compensation. There will be a fixed price for the first year of the scheme, and a market-established price from 2012/2013 onwards but for the first four years there will be a maximum price cap. The price cap will be $40 in 2010/2011 escalated by 5 per cent real growth per annum, so depending on inflation somewhere around the $46 mark in the 2012–13 year.

An important element of the CPRS is that it is designed to be able to be linked into the international carbon market. This is important for a couple of reasons. It provides liable parties in Australia with access to a broader range of abatement options, and as such, it can help to limit permit costs. For example, it will mean that an Australian business that requires extra permits will be able to purchase these internationally, and not just be limited to the Australian market.

Another important aspect of international linkage of the CPRS relates to the Australian Government's commitments under the Kyoto Protocol. By having the CPRS linked into international carbon markets, AEUs are equivalent to similar permits created in other Kyoto Protocol countries, and all can be included in calculations to determine whether Australia meets its emission target.

Under the Kyoto Protocol, Australia committed to limit average annual emissions over the 2008–2012 period to 108 per cent of Australian emissions in 1990. If national emissions exceed this target, the Australian Government is obliged to purchase sufficient international emission credits to 'balance our books' and achieve the Australian Kyoto

Protocol target. This would include units created under the Clean Development Mechanism of the Kyoto Protocol which allows a country with an emission-reduction commitment to implement an emission-reduction project in developing countries, and the Joint Implementation mechanism which allows a Kyoto Protocol country (such as Australia) to earn emission credits from investment in another developed nation. Australian businesses will also be able to use these international credits to meet their emission obligations in Australia. There won't be any international linking in the first year of the CPRS because the price of AEUs is fixed in that year; but certainly from 2012/2013 onwards there will be no quantitative limit on how many of these international permits Australian businesses will be able to use to meet their CPRS obligations.

Another significant transitional element associated with the CPRS is the fuel tax offset and this is relevant for the agriculture sector as well. In the first three years of the CPRS there will be an offset in petrol taxes on a cent for cent basis, which means that every one cent rise in petrol prices as a result of the CPRS will be offset by a one cent reduction in fuel taxes. For diesel used on farms, there will be a cent-for-cent increase in the rebate paid to farmers to offset diesel price increases. There will also be a one year fuel tax offset in the price of fuels used by heavy on road transport, and there will be equivalent treatment of other transport fuels.

It is fair to say that one of the most controversial elements of any emissions trading scheme is how the permits are allocated. Some international schemes initially distribute a large proportion of permits at no cost, and then slowly increase the proportion that businesses need to buy. Others make permits available based on previous years emissions, but place limits on the numbers available to each business. Making a decision on how to allocate emission permits will always be difficult, as it brings in issues of efficiency and also matters of equity; and on matters of equity people tend not to always see eye to eye.

The Government has made some commitments that it believes will achieve a balance in how permits are allocated. A significant proportion of the permits issued each year will be auctioned, and the Government has committed to making sure that every cent that it raises through this auction will be used to help businesses and households to adjust and to invest in clean energy options.

Probably the most controversial element of the design of the CPRS is the question of assistance for emissions-intensive and trade-exposed businesses. It is obvious that different countries are implementing policies to restrain greenhouse emissions at different times, and that some countries will not be imposing restrictions on emissions for some considerable time. This creates the potential that businesses in Australia will be competitively disadvantaged in comparison with some overseas businesses, and the economic activity (and the emissions) will move offshore, at an economic cost to Australia but with no net global emissions advantage. This is referred to as 'carbon leakage' and is obviously something that needs to be considered in the CPRS design.

We also know that for some businesses involved in emissions-intensive activities there is a need for transitional assistance in any event. The Government is providing assistance and has thought about the issue of balance. It needs to make sure that any assistance given to businesses in this group is in proportion, it's got to think about assistance requirements for other groups as well, and it does need to make sure that it provides that assistance in a way that still maintains incentives to reduce emissions.

There are broadly two tiers of assistance that will be made available for businesses involved in emissions-intensive and trade-exposed industries. The Government has decided that this assistance will be in the form of free emission permits. The eligibility requirements for this assistance are that the business is involved in a trade exposed activity (more than 10 per cent of the total industry value is either imported or exported each year) and that the activity meets an emissions intensity criteria.

There are two rates of assistance that will be provided. Businesses that are highly emissions-intensive will initially receive 90 per cent of their required emission permits for free, and moderately emissions-intensive businesses will initially receive 60 per cent of their required emission permits free.

Emission intensity	Level of assistance
Activities above 2000t of emissions per $1 million in revenue or 6000t/$m value added	90% of permits initially allocated free of charge, declining by 1.3% per annum
Activities between 1000t–1999t of emissions per $1 million in revenue or 3000t–5999t/$m value added	90% of permits initially allocated free of charge, declining by 1.3% per annum
Global Recession buffer – increase in free emission permits of 5% for 90% free-permit activities, and 10% for 60% free-permit activities	

One of the new transitional arrangements is an adjustment to these rates, called the Global Recession Buffer. For high emissions-intensive businesses that will mean an extra 5 per cent of free emission permits, and for moderately emissions-intensive it will mean an extra 10 per cent of free emission permits, and this extra allocation of permits will be continued for five years. This assistance is dependent on output so the more a business produces, the more free permits the business will receive. Conversely, if the business shuts down it would no longer receive any free permits.

Another component of adjustment arrangements is the Electricity Sector Adjustment Scheme, and there will be a number of permits allocated to the most emissions-intensive coal fired generators. This measure is designed as a way of making sure that confidence is maintained concerning the viability of investments in Australia's electricity generation sector.

There is also another stream of assistance called the Climate Change Action Fund and this has got four streams associated with it. While the above measures address the challenges faced by the emissions-intensive trade-exposed industries and the electricity generation sector, there are many, many industries that aren't in either of those categories but are still going to need help to adjust. It is for these businesses that the Climate Change Action Fund (CCAF) has been established, which will have a total value of about $2 billion. There will be $200 million of this fund allocated in 2009/2010 so that businesses can get in early and help people adjust and invest in things like energy efficiency projects and provide information.

The four streams of the CCAF, include measures to provide information to businesses and community service organisations; rebates for low emission investments; structural adjustment assistance; and assistance for high emission coal mines. The aim is to ensure that if there are particular regions or groups of workers that need assistance there will be funds available.

There will be a new independent regulator set up called the Australian Climate Change Regulatory Authority, which will have the role of administering all the rules of the CPRS. This authority will also take on some existing responsibilities of environmental regulators.

To conclude, I want to specifically talk about some of the issues that are relevant to agriculture. Figure 2 provides a breakdown of the sources of agriculture emissions. Around 66 per cent of agriculture emissions come from enteric fermentation, which is the digestive process of ruminant animals such as sheep and cattle. Another large proportion arises from agricultural soils, mainly associated with nitrogen fertiliser use. The emissions arising from prescribing burning of savannahs in northern Australia is also a significant source of agricultural emissions.

Given the source of these emissions there are some particular issues that need to be thought through in relation to agriculture. First of all, a decision is yet to be made about whether farm businesses will be required to participate in the CPRS, or face a liability for their emissions. However, even if agriculture emissions aren't included in the CPRS, there will still be implications for agricultural businesses because of the anticipated flow on of carbon prices into energy and energy-related products, many of which are used by farm businesses. This will mean that the cost of these farm inputs can be expected to increase.

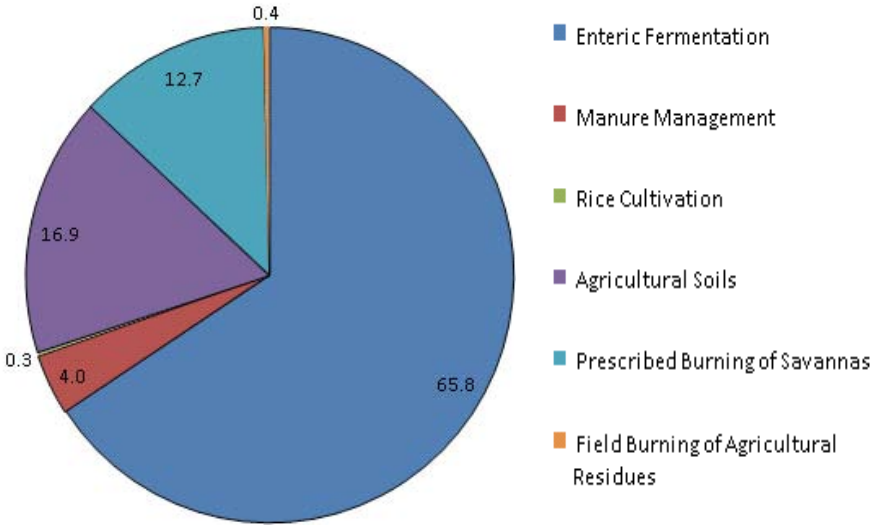


Figure 2: Sources of Australian agricultural emissions.

However, not all the implications of the CPRS for agriculture will be negative. There will be potential opportunities with farm forestry development, as growing trees sequester greenhouse gases from the atmosphere, and eligible forest areas will earn emission permits which will have a value and will be tradable.

There has been a lot of discussion about soil carbon and biochar, and the potential that might be available for farmers undertaking activities to sequester carbon in soils. These activities have not been included as 'offsets' under the CPRS for several reasons. The most important of these is the fact that Australia has opted not to include soil carbon in the national greenhouse emissions inventory, because of the risks created by international emissions accounting rules which do not distinguish between natural and human-induced changes in soil carbon. As a consequence of this decision, soil carbon sequestration is not counted in Australia's national greenhouse emission inventory, and therefore soil carbon sequestration would not count when it comes to estimating whether or not Australia has met it's international emission target.

To explain this a little more clearly, imagine there is a coal-fired power station that emitted 4 million tonnes of emissions. These emissions would be counted in calculating Australia's national emissions inventory, and therefore included in calculations to assess whether or not the nation has met its Kyoto Protocol target. If that coal-fired power station purchased 4 million tonnes worth of forestry credits to offset those emissions, these would also be able to be included in the national inventory, and in terms of the national obligation those have cancelled each other out. However, if the power station produced the 4 million tonnes of emissions and purchased soil carbon credits to offset them, a different situation exists. The soil carbon credits do not count towards Australia's international obligations, and that means that the Government (taxpayers) would still be liable for that 4 million tonnes of emissions in meeting the nation's international obligations. This highlights that including non-Kyoto Protocol compliant credits in the CPRS will ultimately result in an extra cost for taxpayers because the nation has committed to achieve its Kyoto Protocol target either by reducing emissions or by purchasing international credits.

There may be potential in the voluntary carbon market to be able to market credits from these sorts of activities. The voluntary market is separate from the official market, and exists because people voluntarily decide to offset the emissions from their airline travel or electricity use. Generally, the price paid for offsets in the voluntary market is considerably lower than the price in the official market. However, even for voluntary market purposes further research is required. There is a

need to make sure that there is further research going on and the Government is supporting that research, to make sure that anything that is counted as a credit is scientifically valid. Meanwhile, Australia is at the forefront of arguing for changes in the international accounting rules to recognise the considerable climatic variations that exist in Australia.

The Government is not going to be making a decision until 2013 about whether agriculture emissions should be included in the CPRS. The reason the sector will not be included from the commencement of the scheme is that there are many practical difficulties in trying to design a system that could efficiently include agricultural emissions. As an example, by including the 1,000 largest direct emitters in the CPRS about 75 per cent of national emissions are included. However, in the agriculture sector there are at least 100,000 individual businesses that together account for a further 16 per cent of national emissions. Many of those businesses only produce very small amounts of emissions, but making some of them liable for their emissions and some not liable could result in all sorts of competitive distortions. In some ways the situation is the same for motor vehicle emissions, but in that case there is a very direct relationship between the litres of fuel combusted and the emissions generated, and also a small number of major fuel distributors that are a very efficient point-of-obligation for fuel emissions. I don't need to tell this audience that the agriculture sector is much more complex, without such easy solutions.

As a result, the Government decided that it needed more time to analyse and consider options for agriculture, before including it in the CPRS. It also has created some time to consider what alternatives might be available if the sector is not included in the Scheme. This is a very important issue for people at this conference and those involved in agriculture to be thinking about. From a national perspective, there is a need for all sectors to be making a contribution to reducing national emissions, and ideally businesses should all be facing the same carbon price, or at least the same implicit carbon price. Research very clearly tells us that spreading the emission reduction load across the entire economy is the best way to minimise the cost of achieving the nation's emission target. All of us need to think very seriously about what alternatives there may be to including agriculture in the CPRS. Which alternative policy or policies might be the most cost effective way of reducing emissions in this sector?

The Government has a work program under way and is consulting with the sector and intends to be doing that much more intensively in the coming months. The key questions are:

- In practice, if agriculture were to be a covered sector, what is the best way that could be achieved? and
- If agriculture is not to be a covered sector, then what sort of practical cost effective policies might be introduced as alternatives?

As part of this process, there will be a voluntary farm emission reporting trial commencing in 2011 and that will be an excellent way to test some hypothesis about what might be a cost effective way of measuring and reporting farm emissions. This will be very important, because no matter what policies are put in place there will need to be an accurate and robust information system underpinning it.

I look forward to the discussion and information we will all be sharing over the next couple of days, and will be happy to take some questions.

Some Economic Implications of the CPRS for Australian Agriculture

David Pearce

The Centre for International Economics

David Pearce is Executive Director of the Centre for International Economics. David has extensive experience as an applied economist, having worked on a broad range of issues with the CIE for the past 20 years (before which he was an officer at the Industry Commission, now Productivity Commission). David has been undertaking greenhouse related analysis both in Australian and overseas for the past 15 years, and has extensive experience in a number of areas of agricultural economics, including formal quantitative modelling. David has extensive international experience, including undertaking projects in Vietnam, China, India, Laos, Indonesia, Sri Lanka, Bulgaria and the Central Pacific.

My talk today details some research that takes a detailed look at the farm-level implications of greenhouse emissions trading. The research was a project that the CIE carried out for the Rural Industries Research and Development Corporation (RIRDC).

However, before talking in detail about that research, I first want to provide a perspective on greenhouse emissions trading. A lot of the time when there is public discussion about emissions trading, there is a sense that the main objective is punishment, especially for those industries that are producing a lot of emissions. But in actual fact, that's not what the main objective of an emissions trading scheme is. The main objective of an emissions trading scheme is to provide incentives that will enable the nation to effectively harness the creativity of a large number of people to find better ways of doing things, without producing as much greenhouse emissions as was the case in the past. It is a very positive set of institutional changes that the Government is trying to implement, in order to find cost effective solutions to what is widely viewed a global problem. I want to encourage all of you to keep this positive creativity aspect in mind as we talk through some of the implications of emissions trading for agriculture.

The objective of the research that I will discuss today is not to provide the sector with information that can be used to beat the Government around the head, and to argue that agriculture should not be included in an emissions trading scheme. Nothing in this report answers the question about whether or not agriculture should be included in the CPRS. That is an economy-wide question that, of necessity, encompasses many other things. The purpose of this research is to make sure that everybody, including the farm sector and the Government; are walking into this with their eyes open so all know what's at stake, and so there can be some really rational thinking about options and cost effective ways of dealing with the issue. One of the unfortunate aspects of putting research out into the public domain is that it is not possible to control how people use information. However, I want to reinforce that the intent of both the CIE and the RIRDC is to make a positive contribution to the debate.

Much of what I will be talking about today concerns the effect of an emission or 'carbon' price on the farm sector. A carbon price could be imposed in many different ways. It could be imposed through implementing an emissions trading scheme. It could be imposed directly through a tax, or it could indirectly be imposed as an implicit price that is a consequence of regulations. Even though our research dealt with the impact of emissions trading on agriculture, in reality the research concerns the impact of imposing a cost on greenhouse emissions,

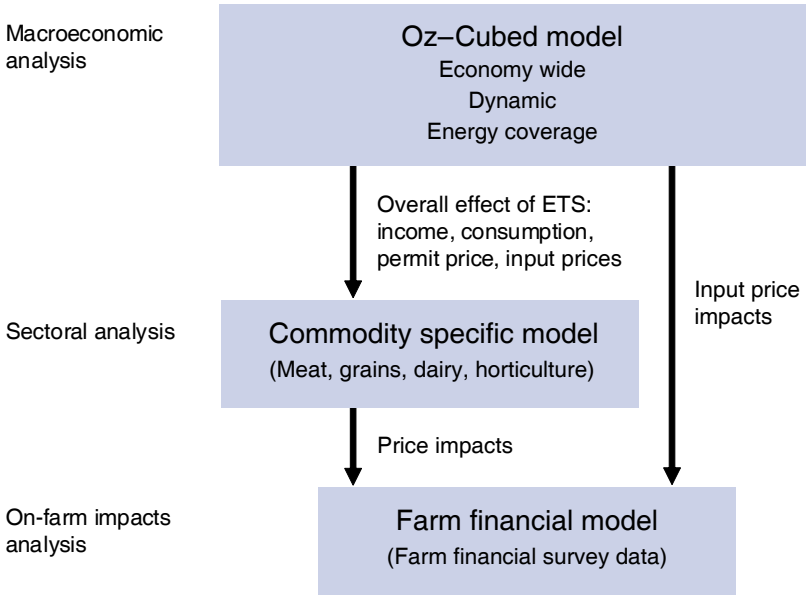


Figure 1: Linkages between economic models used in CPRS analysis.

whatever mechanism is used to impose that cost. Towards the end of my presentation I will provide some thoughts about the best way to impose a cost on emissions.

Research Methodology

To carry out this research, a number of different economic models were used. To ensure national consistency, we start with an economy-wide model, which allows the interactions between different sectors of the economy to be projected. This enables the broad, economy-wide impacts of particular policies to be projected, and then we do what in technical terms is called a sequential top down disaggregation of the economy-wide results to specific sectors and sub-sectors of the economy. From there, the results are then projected down to the individual farm level, so an understanding can be obtained of the implications for farm businesses. A more detailed technical discussion of the methodology is provided in the research report.

What are the important factors to consider when doing this sort of economic modelling? Obviously the first thing is the emissions intensity of a particular activity, because at the end of the day the size of the cost impact associated with the inclusion of a sector in an emissions trading scheme will depend most on the amount of emissions that activity is estimated to produce. In the research we have adopted conventional emissions accounting as is used in estimating Australia's national greenhouse inventory, because those are the emissions that farm businesses may be made accountable for at some time in the future. It is worth noting that these emissions calculations are not the same as would be estimated using life cycle analysis methodologies, and do not include items such as soil carbon that are excluded in Australia's national greenhouse inventory.

The second factor that is obviously important is the assumed price of carbon, and how that is assumed to change over time. No one actually knows what the price of carbon will be, once the $10 price cap is removed at the end of the first year of the CPRS, although we do know that the price will be capped at a maximum of about $40 for the first couple of years. There is a range of estimates available from various sources. Rather than trying to predict what the price of carbon might be, we've provided some illustrations in this research using both $25 and $50 as the price of carbon. I want to reinforce that this is not a forecast, although I note that the price of carbon in the European emissions trading scheme is currently close to $20.

A third factor that is very important is the assumptions made about whether other countries implement measures that impose a cost on emissions from agriculture. In this research, it has been assumed that only New Zealand imposes a cost on, or 'covers' their agricultural emissions. The research assumes that other countries do not impose a cost on agricultural emissions. This is quite important, as some developing countries are quite big competitors in some of Australia's important markets like beef. There is some sensitivity analysis in the report that tests the importance of that assumption. The implications of this for Australian farmers could be quite significant, and I will talk briefly about adjustment options for the farm sector later in this presentation.

Research Results

The results arising from the economic modelling research are summarised in the following graph.

This modelling has used farm costs and revenue data sourced from ABARE's AGSurf database, which contains data sourced from farm surveys carried out annually on a sample of typical broadacre farms. It also used data from ABARE surveys of horticulture and sugar industries. The farm categories included in the research include wheat and cropping specialist farms, mixed livestock and cropping farms, specialist sheep, beef and dairy farms, and also sugar and horticulture farms.

In Figure 2, the top set of bars are the projected change in net farm returns under a $25 emission permit price, and the bottom set of bars are the projected impacts under an emission permit price of $50.

The light blue part of each of the bars is the projected increase in farm costs, and the dark blue part of each of the bars is the projected increase

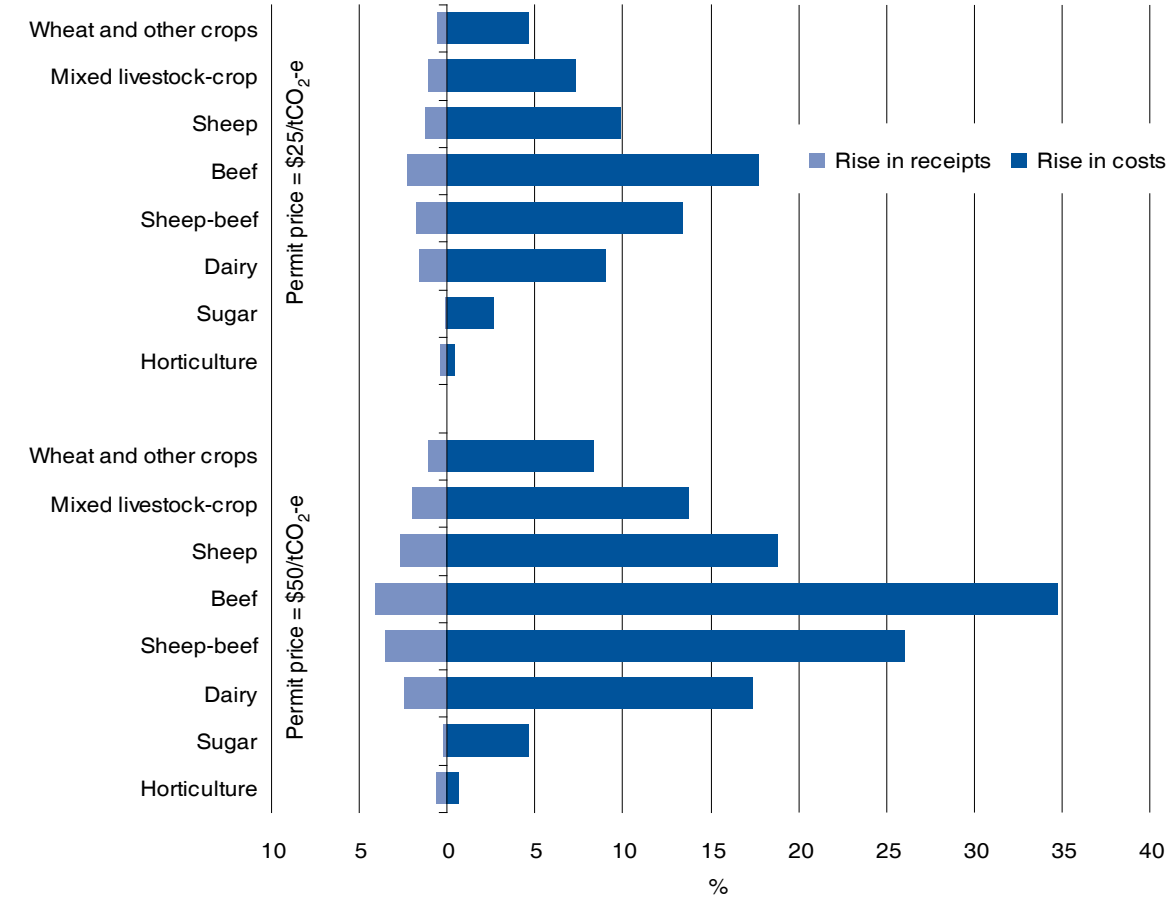


Figure 2: Projected impact of the CPRS on 'average' farms, $25 emission price (top) and $50 emission price (bottom).

in farm receipts. The results project a substantive increase in farm costs as a consequence of the $25 emission permit price. Most of that comes from the requirement to purchase, or the potential requirement from 2015 to purchase emission permits equivalent to the level of farm emissions. The dark blue part of each bar graph is the proportion of those cost increases that is projected to be passed on to consumers via higher prices for food and agricultural products. The amount of extra costs projected to be passed on to consumers is estimated using CIE's international models and it is essentially determined by the trade exposure of the farm sector. For sectors such as sugar, horticulture and grains increases in imports are likely, reducing potential consumer price increases. Increases in imports of beef, sheepmeats and dairy products are less likely, and therefore it is projected that there will be greater price increases in Australian markets for these products, as farmers face higher production costs for these commodities and reduce output.

One of the key things to observe from the results is the potential for there to be a large impact on the beef sector, a consequence of the emissions intensity of beef production. About two-thirds of agricultural emissions are from enteric fermentation, which is the digestive processes of sheep and cattle. The projected effects on other sub-sectors of agriculture are correspondingly smaller, but there is nevertheless a substantial projected effect even on mixed enterprise farms.

The projected cost impact on farm businesses increases proportionately with the permit price, as the biggest cost impact of the CPRS on farms will be as a consequence of required emission permit costs. This is highlighted in Figure 5 (below) which shows the proportion of total cost increases for each farm type associated with the requirement to buy permits.

The balance of the cost increase that is projected for each farm type will arise from the indirect impacts of the CPRS on fuel and energy costs. Fuel distributors and electricity generators will be required to purchase emission permits, and will add the cost of these permits to their overall operating costs. These costs will, in turn, be passed on to consumers, including farmers, in the form of higher fuel and energy costs.

Given this information about projected changes in farm receipts and farm costs, and also given information about the structure of costs and receipts for the average farm, it is possible to project what this will mean for future farm cash income, which is really just cash receipts minus cash costs. These projections are shown in Figure 4.

For the beef sector, the graph indicates a change in farm cash margins of more than 100 per cent. This means the beef farm in question would go from making a profit to making a loss, if the manager did nothing in response to the CPRS. This result is not particularly meaningful, except in highlighting that

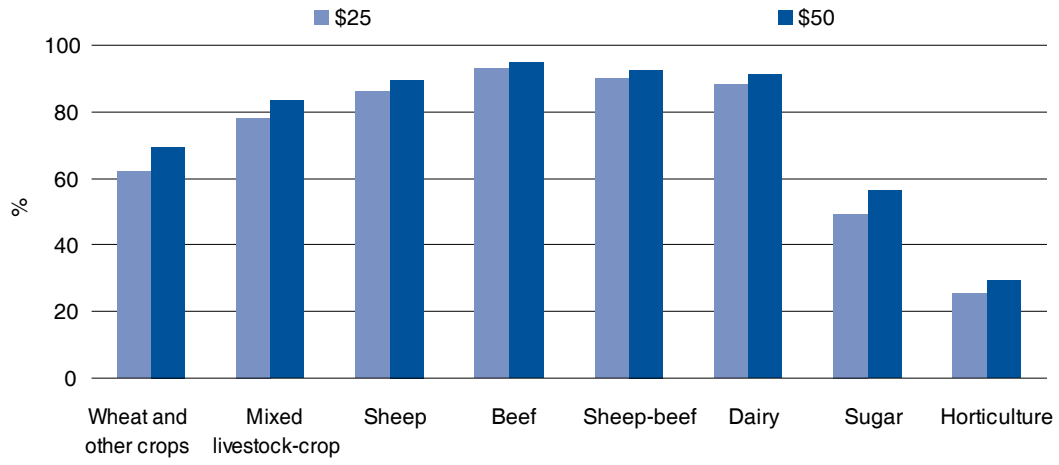


Figure 3: Share of farm cost increase due to emission permit costs.

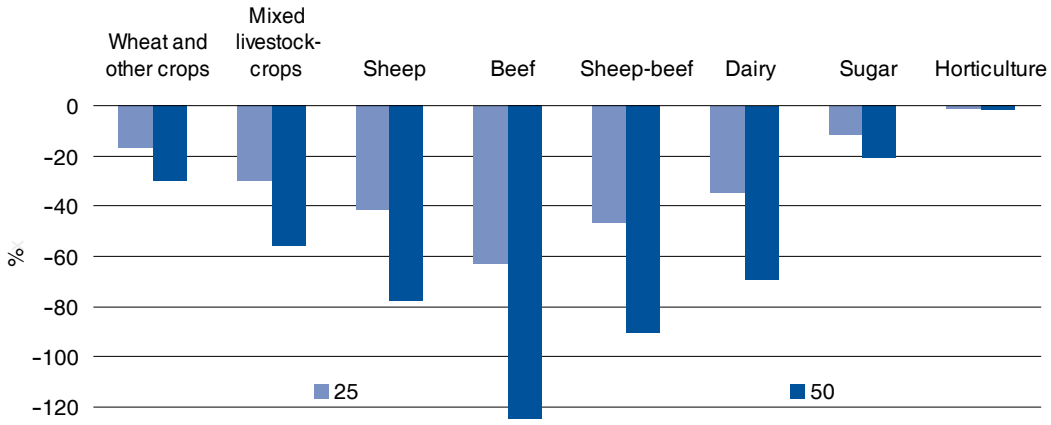


Figure 4: Changes in farm cash income.

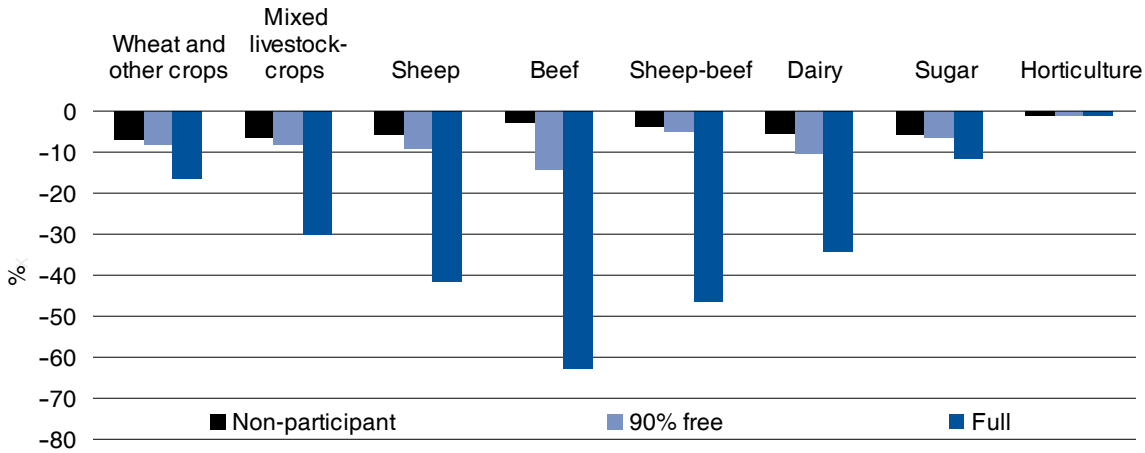


Figure 5: CPRS impacts under different permit allocation scenarios ($25/tonne permit price).

for a beef farm under the assumptions used in this analysis, the impact of the CPRS would be quite substantial.

There are some important caveats to these results. It is not possible to accurately predict the structure of farm costs in 2015, so this analysis simply projects current structures and trends into the future. Such a projection could be quite inaccurate depending on developments over that period, but at least the percentage changes provide a reasonable indication of the adjustment pressures farmers are likely to face if these policies are implemented.

It is important to understand that these projections represent a worst-case scenario, under which farmers will be required to purchase emission permits to cover all farm emissions. There are indications from the Government that this may not be the case in the event that agriculture becomes a covered sector after 2015, because a number of agricultural activities (beef, sheep, dairy, rice) meet the criteria for Emissions Intensive and Trade Exposed (EITE) assistance. If such assistance was made available to farm businesses, it would mean that farmers involved in these activities would receive almost 95 per cent of their initial permits free of charge, with their free permit allocation declining by around 1.5 per cent per year. Farmers involved in the less emissions intensive pork and sugar industries would receive almost 70 per cent of their initial permits free of charge, but those involved in other activities – especially broadacre crop production – would not receive any free permits. The impacts of 90 per cent free permit allocation for all agricultural activities are shown in Figure 5 (above).

For each farm type, the projected impacts of three different CPRS scenarios are shown, with an emission permit price of $25 per tonne. The black bars show the projected impact of the CPRS on different farm types if farm businesses remain as non-participants in the CPRS and farmers do not have to buy permits for their farm emissions. This is the 'indirect CPRS impact' discussed earlier. The dark blue bars show the projected CPRS impact on farm businesses if farmers were required to buy permits to cover all their farm emissions. The light blue bars show the projected impact if farm businesses become CPRS participants, and receive 90 per cent of their required emission permits free of charge.

It is worth noting that the indirect CPRS impacts (the black bars) are not something that is unique to agriculture. This impact of the CPRS will be an economy-wide impact, experienced by all consumers of fuel and energy, or of products that include a significant proportion of fuel and energy in their production or delivery.

Adjustment by the Farm Sector

An important issue for Australian agriculture is how the farm sector might adjust to these changes. The results displayed in the above graphs assume that the farm sector just passively accepts these various changes in costs, which in reality would not be the case. As a result, these are illustrative results rather than projections of what might actually happen. Clearly, if cost impacts such as these were imposed on farm businesses there are a number of different responses that would be made by farmers. One of the most obvious ones is for those farm managers who can do so to change the enterprise mix on their farms. Figure 6 (below) provides some information that assists in understanding the implications of such changes.

The graph shows the proportion of total farm revenue on a cropping farm, and a mixed livestock and crop farm that comes from livestock and crops. It also shows the proportion of total farm emissions from livestock and cropping sources.

It is apparent – at least for these mixed enterprise farms – that there is a disproportionate share of emissions coming from animals relative to the share of revenue. Clearly there is an optimal change in enterprise mix which these enterprises can undertake in order to minimise the effect of a cost associated with emissions, and this change would involve reduced animal production and increased cropping production.

Another option is for farmers to plant trees, either as commercial plantations or as environmental plantations which will be retained in perpetuity. There are some illustrative examples in the research report that show both how hard and how easy this will be for farmers. Planting trees is an easy option

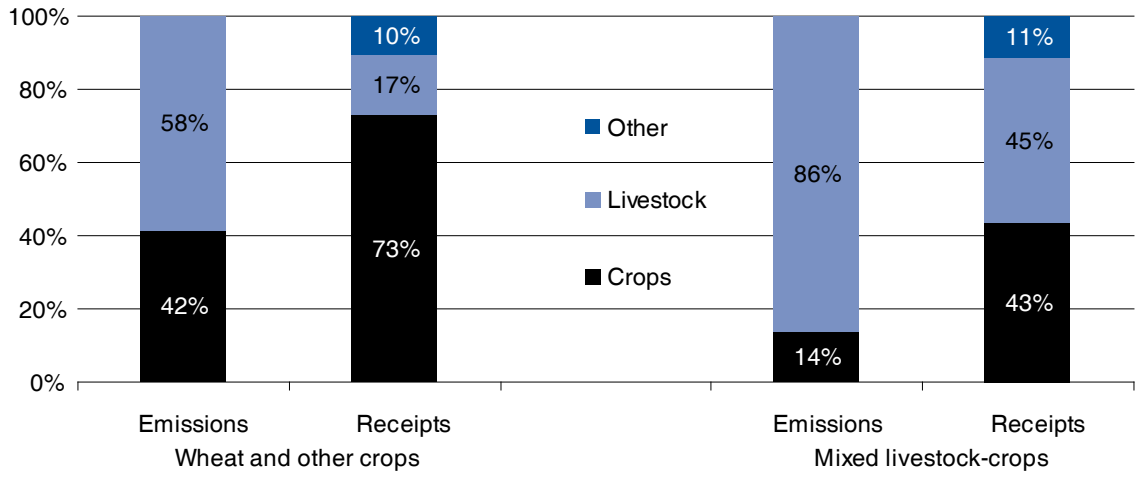


Figure 6: Proportion of total farm receipts and emissions from livestock and crops.

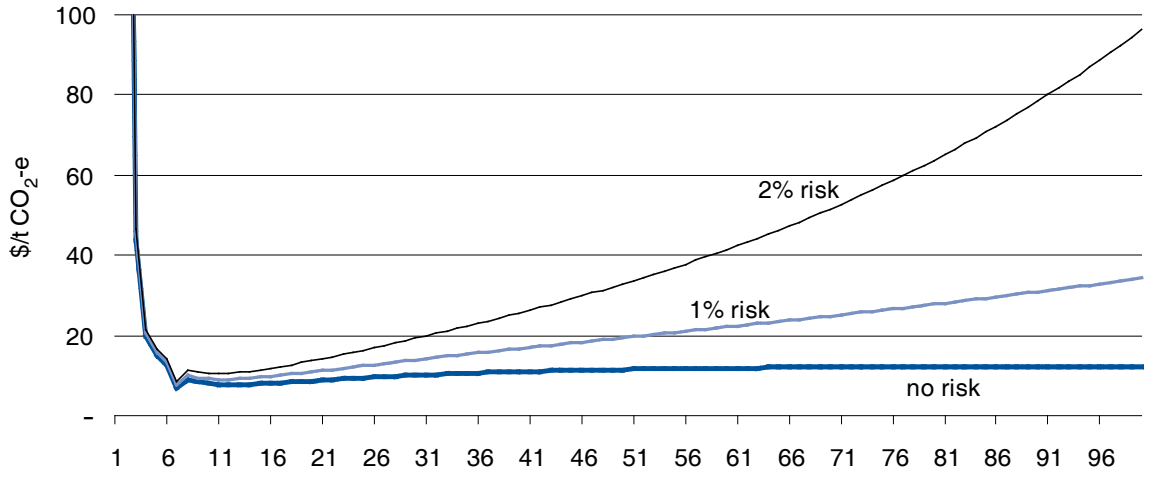


Figure 7: Cost of sequestering accounting for risk.

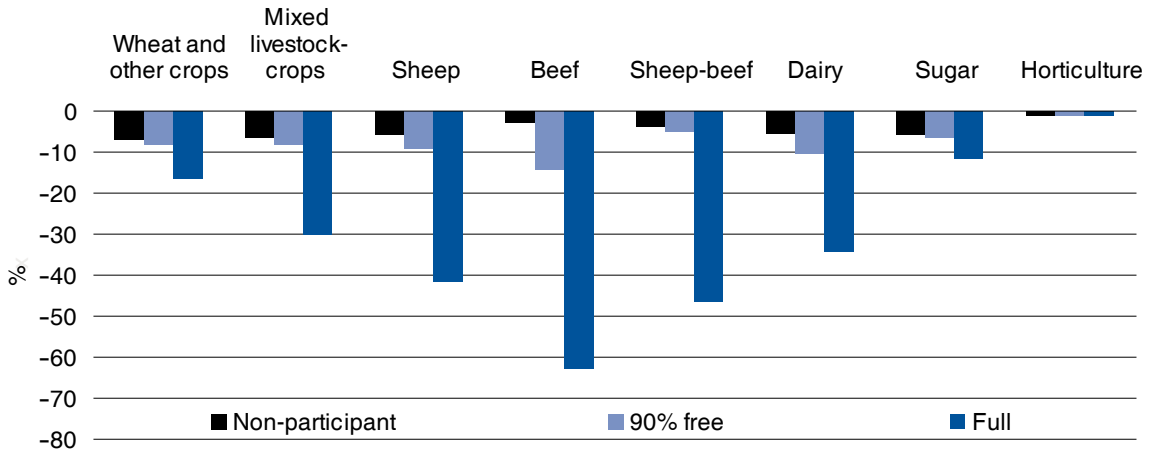


Figure 8: Required productivity improvement to negate CPRS cost impacts.

in the sense that if you ignore the risk of the trees being burnt or killed by disease, then over time the cost of establishing that plantation, in terms of dollars per tonne, declines very rapidly and ends up being quite low. The following graph is an illustration of this result.

It takes into account the cost of land (assuming $10,000 per hectare) and project that the long-term cost of sequestering one tonne of carbon dioxide equivalent would be $31.50 assuming no risk, $86 per tonne assuming 1 per cent annual risk, and $240 per tonne assuming 2 per cent annual risk.

A very simple risk accounting model was used for these calculations. However, it illustrates that risk is increasing over time and if sequestration in trees is to be used as an option on farm, then farmers will need some financial or other instruments to deal with that risk.

The other response farm managers could make is to take action to increase productivity on farm in order to reduce the impact on farm cash income. The following graph shows the range of rates of productivity increases that would be required, on average, over those periods shown in order to offset the cost effects of having to buy emission permits.

This required rate of productivity increase is obviously dependent upon the price of emission permits, so this is simply an illustration of what might be required under a particular emission price scenario. It should also be noted that this productivity growth requirement will be over and above the normal productivity growth requirement to remain internationally competitive. It is apparent from the graphs that in the period to 2016 the need for productivity growth will not be as great, but once agriculture becomes CPRS covered from 2016 onwards, the productivity growth requirement becomes quite large, and certainly greater than historical productivity growth trends. The productivity growth rate needed to offset the cost is higher than historical levels, and achieving this productivity growth is also more problematical because some of the historical productivity improvement has come about through using more nitrogen fertilisers which of course themselves emit greenhouse gases. This new productivity improvement will need to come from different sources, other than from the increased use of nitrogen fertiliser.

Conclusions

What should those involved in agriculture conclude from this research? Perhaps the biggest uncertainty factor in all this analysis is the long-term price of greenhouse emission permits. In the absence of a credible projection of this, farmers have no way of determining the scale of the potential impact of the CPRS and therefore the size of the adjustment effort that will be required.

In cases like this, it is actually the price signal longer term in the future that will drive people's behaviour, not so much the price that emerges immediately. This means that a credible long-term price of carbon is going to be a very, very important instrument for farmers to make decisions about adjustment. It is also generally better if that price is explicit, that is if it's something you can look up in the same way that you will look up auction prices at the sale-yards or share prices. If it's a price you can actually look up, if it's traded on a Futures Market, it's much better because that price is explicit and obvious to everyone. The alternative is to have a cost of carbon that's hidden away in a regulation or hidden away in a standard for performance or something, where there is great uncertainty about what that cost is. The other thing a credible long-term price of carbon will do is to help remove some of the uncertainties that exist at the moment about whether things like soil carbon sequestration will ever actually be economic as an option for farmers, and for the nation. We will only know the answer to that issue if there is an explicit and very transparent price of carbon.

Similarly, associated with that price of carbon, the farm sector will need tools for managing uncertainty. The farm sector has some tools now, there are some futures markets that exist for some commodities and for currency exchange risk. There will be a set of tools needed to manage carbon risk as well. Those tools will emerge I think once you have a very explicit and transparent price of carbon.

Finally, ongoing research and development (R&D) is very important. The Government has announced a research program to address some of these issues, and a continuing R&D effort will be essential to help the sector address some of these challenges. I should emphasise that this is actually a time when ongoing R&D within the farm sector is incredibly important. Establishing a price for carbon emissions provides a very explicit target to focus that research, and also means there can be very accurate cost/benefit calculations performed to justify that R&D effort.

I will finish at this point, and am happy to take questions.

Panel Session: Anthea Harris & David Pearce

Q. While the audience is digesting the information you have both provided, I would like a response from both of you to the situation of an individual farmers who has just heard your presentations. To put it bluntly, I suspect that the information that has been provided would scare the pants off any farmer in the room! It's OK to talk theoretically about a need to achieve a 4 per cent annual productivity increase or face a 100 per cent drop in farm cash margins, but when you think about it in terms of an individual farm business, it really does scare the pants off you. I think many farmers would say we know those productivity numbers are simply not achievable, so how in the hell are we going to manage this? Does this dose of reality ever get injected into any of the policy discussions and economic analysis?

David: Do you mind if I start? The question is all about reality versus what we models project. I think you're absolutely right. I mean from an individual farmer's level this looks scary, although it's not meant to look scary. I think the point is that it's not a done deal yet exactly what form agriculture's involvement in the CPRS will take, or whether agriculture will be included. This economic modelling is designed to provide information for farmers to think about how they might adjust. Now if I did the same sort of thing as this for exchange rate risk, for example, I could produce a set of numbers that looked very scary for farmers concerning the degree of risk they face from changes in exchange rates. We know that risk needs to be managed, and farmers or agribusiness take appropriate action to manage the risk, and to make sure the 'worst-case' outcomes do not occur. In the same way, knowing the 'risk' associated with the CPRS provides everyone involved with information to ensure the 'worst-case' scenario does not eventuate.

There is a very strong argument in an economy-wide sense to include agriculture in emissions trading, particularly given that agricultural emissions are so prominent in Australia's inventory. So what this sort of information is saying to farmers is look, you've got to sit down and start thinking about this. Don't panic, right, but go and talk to your relevant R&D organisations, your rural peak bodies, the Australian Farm Institute, and start a process of thinking about how we might adjust and engage positively in this process. I think there is a big advantage in the time that has been allocated to think about this for the farm sector. I think it should be possible to engage and use this sort of information in a positive way. Sure it is going to be hard, sure it is going to be challenging, but I think at the end of the day positive engagement will probably get further than just panicking and hoping the issue will go away.

Anthea: That is exactly the view of the Government on this issue. There is time to engage in discussions and think about what the right way to deal with these issues is. The point David made about R&D; that's tremendously important. Australian agriculture needs to have a real

focus on how we can reduce emissions in the agricultural sector in a cost effective way.

Q: There seems to be two different conversations going on here, if we take a straight line through various reports on the potential impact of the CPRS on farmers. There has been a number of research reports released which project quite large impacts of the CPRS on agriculture. Then there is other research which has been released, particularly by ABARE, which project much smaller impacts. There is quite a gap between what I see as two contrasting lines of reporting on potential impact on farming. I'm wondering how do you reconcile that? Secondly, what information is used by the Department of Climate Change (DCC) in understanding the potential impact on farming, and in designing workable policies?

David: Can I just comment on the results obtained in the CIE analysis, and the results reported from ABARE research. The CIE provide a reconciliation of the differences between these two pieces of research in our most recent report. The results aren't actually different, it's just these two pieces of research rely on different assumptions – either about permit price or about international participation. ABARE assumed simultaneous international cooperation on climate change policy in their research, while the CIE research assumes that Australia goes it alone in adopting policies that impose an emissions liability on agriculture. If you adjust the results of either study to reflect the assumptions made in the other research, the results are actually very similar. The ABARE research report also incorporates slightly different commodity aggregations to the CIE research, but this is not a significant reason for the differences in results.

The key to understanding any modelling is to understand the underlying assumptions made, and so the CIE has tried to make them very explicit. I don't think there's anything controversial about the magnitude of the numbers that the CIE reported, given the assumptions behind them, and as I said, the ABARE research would provide similar results if the same assumptions were used. In effect, the difference between these two reported outcomes provide information about what may happen in the event that overseas nations do not implement emissions policies for their agricultural sector at the same time that Australia does.

Q. So if I can paraphrase that David what you're saying is that the CIE assumptions are 'without international cooperation', particularly in the agriculture sector. So in other words, the outcome if Australia is going it alone, perhaps only with New Zealand?

David: Only with New Zealand.

Q. Whereas generally the ABARE assumptions were that there would be international cooperation, starting at about 2010 but then progressively increasing through 2015.

David: That's right, yes.

Q. So that might just clarify that. Anthea did you want to comment on.it?

Anthea: In relation to modelling and the task of trying to get better underlying of policy implications, obtaining better data is always an ongoing process and certainly ABARE is our main port of call in terms of trying to get better data about the agriculture sector, but we certainly don't see any of the work that we've done as an end point. There has already been work done trying to do more disaggregation in the dairy industry, for example, that

ABARE has been working on. All of these research activities are part of a continuing process, which will provide more information to base future policy decisions on.

Q. My question is specifically for Anthea. You mentioned that there is a work program being developed by the Government for the agriculture sector to inform future decision-making. I was wondering what opportunities there are for the agricultural industry and for the states in particular to be involved in those processes, because that's what I'm interested in. I see a need for the states to actually be participants in the work that goes on within the Department of Climate Change in relation to these issues.

Anthea: Well certainly, we already have a Ministerial Roundtable that has been established. We will be establishing a Technical Options Development Group that will sit underneath that to be involved in the technical level work necessary to underpin some of the policy decisions that will be required. On the issue of engagement of states and territories, we have a forthcoming meeting very soon through the COAG process that will begin the engagement of the states and territories in these matters. More generally, we will be looking for opportunities to talk to states and territories and incorporate their expertise in the process. We are very keen to do that, because we know that there are many entities involved and we know that state governments have good expertise, they have good networks, and they potentially have a whole lot of skills and programs that we can be leveraging from.

Q. A question for David. I'm wondering if you could describe for us a longer-term scenario whereby there is broad international agreement on the need for emission restrictions, because I would imagine that the cost of carbon then just becomes another production cost and our relative position in terms of export competitiveness stays much the same. Under that scenario, what mechanisms might be used by Australia or the international community to address the problem of a large beef-producing nation that refused to implement emission restrictions?

David: In response to the first part of your question, if beef producers globally all face emission restrictions, then we are all on a level playing field. Then it gets down to the relative efficiencies with which national beef industries can achieve productivity improvements in the future, which is essentially business as usual. If the Australian beef industry can find a smart way of reducing methane emissions from cattle, that will give us a big competitive advantage relative to competing counties. In fact that's the kind of result that greenhouse emissions trading aims to achieve.

However, the impact on beef producers won't be totally neutral because of the impact on consumers. Consumers will see a change in relative prices, with beef increasing more rapidly than chicken or pork. The impact will be neutral between competitors, but it won't be neutral between products, and less emissions-intensive products will gain an advantage. The second part of your question referred to actions we could take if Australia was part of a global emission effort, but a large beef-producing nation decided not to cooperate.

Australia's response in this situation would need to be very, very carefully considered from an economy-wide perspective, but there remains the possibility of border price adjustments (carbon tariffs). These would probably be WTO compliant as long as imported and domestic products are treated exactly the same.

However, at the end of the day it's difficult to make those sorts of measures work. It is already evident how difficult it is in the WTO to stop the very bad behaviour of nations that apply protective policies to their agriculture sector, and a carbon-tariff would add another layer of complexity.

Q. My question concerns the potential of agriculture becoming a CPRS-covered sector and livestock producers receiving 90 per cent of their required emission permits free of charge. Do you think that a 10 per cent emission cost is bearable but enough of a signal to drive innovation to reduce emissions? A second part to that is presumably the more free emission permits given out the less funding there is for the Government to fund innovation to reduce emissions. How much of a tension is there between giving a price signal to industry and having a pool of funds available to invest in research and innovation?

Anthea: An answer to your question consists of a few parts. First, the 90 per cent free permits are relative to industry averages, not the specific emission output of any individual business. If your business produces fewer emissions than average, then the free permit rate is actually higher than 90 per cent. Conversely, if your business produces more emissions than average, then your free emission allocation will actually be less than 90 per cent of the permits you require.

Second, it is important to remember that the industries that aren't receiving any assistance are bearing some carbon cost and so from an equity perspective we also need to think about whether it is fair to shield some parts of the economy completely from an emission cost? Another issue that we need to consider is that over time industries will improve their emissions intensity. If some industries were given 100 per cent free permits, over time the result would be over-compensation.

In response to your observation about the tensions between assistance that you provide directly to any industry and the availability of funds for research, that is exactly the issue at the forefront of the Government's mind when making decisions about how to allocate permits. Any funds that are used for one purpose impose limits on the funds that can be used for other purposes, including R&D.

Q. I'm a cattle producer, and I am standing before you without any pants on! Although I was aware of the issue, your presentations today have got me really scared! Before I completely panic, however, I am interested in asking whether there is an opportunity for agriculture to adopt a different model? Some of us been a bit keen on a 'baseline and credit' model for agriculture, so is that an option? That's question one. Question two is, with 2012 Kyoto negotiations looming, and the impact that's going to have in terms of where agriculture's mitigation capacity is going to be; why is the Australian Government only putting pitiful amounts of money into agricultural emissions R&D. Because if the sector can't find some form of offsets, I can tell you as a cattle producer we are all out of business, and I'm a pretty big one.

Anthea: In relation to the Government decisions about what tools will apply in the agricultural sector, as I said, the Government hasn't made any decisions. It does have a predisposition to include agriculture in the CPRS from 2015 if it can be cost effectively achieved, and work is underway to assess whether that is feasible. From a national perspective, that would be the least expensive option.

In relation to the actual model for agriculture's involvement in the CPRS,

nothing is ruled out at this stage. However, I would say that developing a baseline and credit scheme for one sector of the economy and a cap and trade system for the rest does introduce some complications. We do believe that a cap and trade scheme is a) simpler, and b) likely to be less costly than a baseline credit scheme for the nation as a whole. The same rationale that favours a cap and trade for the economy as a whole also favours a similar approach for agriculture. However that's all work to be done, and we need to spell out what the other potential policy options would be and sit down and do the serious analysis to identify which one is the most cost effective.

In response to your comment about R&D funding, the Government has made some significant new contributions to R&D in this sector, including in relation to methane mitigation for beef cattle. Is there more work to be done? Yes, we do recognise that it's an important issue and it is a priority however governments need to make their budget decisions in the context of everything else. Please remember that this isn't a one-shot game, and the amount of money that's allocated for emissions R&D in agriculture at the moment it's not the final amount of money that's going to be provided. As this issue develops, the Government will continue to reassess priorities.

Q. Are you saying that if the farm sector came up with an alternative package of complimentary measures which enabled it to reduce emissions the Government be open-minded about that or is the decision being made in the context of how best we might include agriculture in the cap and trade scheme?

Anthea: As I said the Government has not made a decision, although we have very good reasons for believing that having all industries in the CPRS on the same basis is likely to deliver the least cost outcome from the nation's point of view. It's the Government's job to be thinking about these things from the interest of the nation as a whole. The Government will be looking at a whole range of options as part of that process. I should also mention that the CPRS will not be the sole policy instrument used to reduce emissions. Even with a cap and trade scheme, there is still room for complimentary measures such as energy efficiency, R&D in particular in relation to reducing emissions.

Q. In the debate about the role of agriculture in the CPRS, the policy-makers seem to have made a conscious effort to keep it focused on the very rational objective of national economic efficiency and jobs. However, agriculture primarily involves food production, and in essence the sector has a fundamental role in the economy, just as the energy sector does. But, what I'm not seeing much in the debate is the Government's perspective of the role of agriculture in terms of national food security and also global food security. Do policy-makers recognise the strong likelihood that agricultural emissions are going to have to increase to meet the challenge of world hunger? To what extent is the Government just shrugging and saying 'well farmers will have to adjust' or does the Government have a role in considering this issue from a broader perspective and thinking about the potential implications of different policies for future food supplies?

Anthea: In all the research that has been done, and David might want to say more about this, food production does not decline, but keeps increasing as the population of the world increases. The composition of food produced might change, but overall none of the studies we've done suggest that there will be a decline in food production, or that food production will not keep pace with growing global demand. Now all of

that said, it would certainly be better if we could find ways of feeding the world that are less emissions intensive than they currently are, just in the same way that energy is also an essential component of modern life, and we need to make sure that we can reduce emissions and still keep the lights on. Governments do take into account these things, and Agriculture Minister Tony Burke has been talking about these things lately and the food security issue is certainly one of the things he's acutely aware of.

Q. One thing that disturbs me is your reference to agriculture being just another industry. I think agriculture is a different industry, and one for which there are limited options to reduce emissions. Equally, if farmers have to participate in an open permit auction, most would not be able to compete with bigger corporate interests. I think there are many farmers who are indeed very apprehensive about the way forward, especially given that whatever happens we are going to be incurring extra costs in our normal day-to-day business passed-on from other industries that are participants in the CPRS. In summary, farmers are facing increased costs, reduced government investment in R&D, limited opportunities to offset our emissions, and reduced incomes in the future. Where does that leave us?

Anthea: I would like to make a few comments in response. First, there probably are some things that can be done immediately to reduce emissions in the agriculture sector, at little cost. Second, for the long term I agree that it's important that investment in R&D occurs to give the sector the best chance of finding ways to reduce agricultural emissions.

I should also tell you that at the Department of Climate Change we have industry after industry coming through our doors and saying they have limited opportunities for emission abatement. One of the things we remind all of them is that the CPRS doesn't set emission caps for any sector of the economy. If it is the case that emission abatement in agriculture is more expensive than abatement in other sectors, then the economically-efficient response would be for agriculture to do less abatement relative to other sectors where it's cheaper for them to do the abatement instead. The best way to make sure all the sectors are doing the right amount of abatement is to have them all facing the same carbon price. At no point in the CPRS does it say 'agriculture, you must reduce your emissions'; it's a cap for everyone overall and it does allow for sectoral differences within that cap.

Q. A question to both Anthea and David. Anthea you mentioned the challenge of 100,000 extra participants in the CPRS if agriculture were included, and you also mentioned the policy that every cent raised from a carbon price will be returned into initiatives to improve energy efficiency. David, you were mentioning the impact on agricultural industries of these prices. What assumptions, in your policy development and in your modelling, are you making for transaction costs, and have you looked at the scenario of 90 per cent free permits and 10 per cent free permits; can you work out how many dollars from that 10 per cent of permits farmers would have to pay for would be needed to pay the transaction costs?

David: The question of how to coordinate the 100,000 farmers who might be required to participate in the CPRS is an interesting one, but one that needs to be kept in context. Somehow at present, our market systems manage to coordinate production from 100,000 farmers and we all get meat in the supermarket, as well as the bulk of Australian production also getting to overseas consumers. This is a coordination task that is addressed

solely by markets and done quite well, and sometimes I think we take that for granted.

On the question of coordinating 100,000 farmer-participants in the CPRS, the point of obligation for farm emissions hasn't been decided yet, but roughly speaking the incidence of the CPRS on farm businesses will be the same regardless of the point of obligation, unless there is a serious market distortion somewhere. If there is a serious market distortion then as a matter of microeconomic reform the Government should be removing that anyway. As you are all aware, we've had a few market distortions (such as the wheat single desk) that have been removed in agriculture.

The challenge in relation to agriculture is a bit the same as the challenge associated with transport fuel. The Government is not going to require each and every vehicle owner in Australia to become an individual participant in the CPRS. The point of obligation for transport fuel will be upstream, but the price effects will flow through and give the same incentives to reduce fuel use to drivers. The same arrangement is possible in agriculture. There is no reason in principle why you can't have the point of obligation for agricultural emissions at various points in the supply chain, that would still give appropriate signals backwards and forwards to the point of emission production, so long as there isn't any market failure or market distortion in between. I imagine some of the work-plan for agriculture would involve examining this very issue.

Anthea: Yes that is correct, and we've certainly heard very strong views from the farm sector that if any obligation is to be placed on agricultural emissions, the preference would be that the point of obligation should be on farm rather than elsewhere along the supply chain. Of course, the questions that we all need to explore are how practical is that, and do we need to compare that against other options. For example, in New Zealand they've been looking at whether you could make dairy and meat processors liable for farm emissions, or make fertiliser distributors responsible for emissions associated with fertiliser use on-farm. These all need to be examined, and we also need to think about the incentives that farmers would have under different systems to reduce their farm emissions.

Q. David, based on my limited understanding of the research outcomes so far, would it be correct to say that by 2030 under the proposed CPRS or an equivalent measure, the ruminant livestock industries are unlikely to exist in their current form? Anthea if that is the case, what alternative food production does the Government see occurring in our rangelands in order that the overall level of food production doesn't decrease?

David: Just to clarify the results, under the scenarios we have examined in our research ruminant production doesn't cease, there's still meat being produced in all of the projections that we do, particularly when the research is carried out at an industry-wide level, as distinct from than at a representative farm level. Beef and sheepmeat production is reduced, and composition of activities on farm is changed so the industry will look very different in 2030 in terms of its structure compared with the existing industry. Mind you, the same comment applies to the electricity industry, the steel industry, the cement industry and the automotive industry. Many sectors and industries will look very different as a consequence of the CPRS, that's the intent. But the research does not forecast that red meat production will cease, and as Anthea said earlier I don't think the projections indicate a major increase in food insecurity as a consequence of the

CPRS, although the composition of food production will change.

Just in response to one of the earlier questions about the ability of the agriculture sector to improve its productivity and adjust, sometimes I don't think you guys give yourselves enough credit. If you look at the history of productivity improvements in agriculture over the long term and leave aside droughts, year in and year out agriculture has delivered higher productivity growth than any other sector of the economy aside from communications and IT. So there has been an enormous, ongoing, productivity improvement in agriculture, which when examined from an economy-wide perspective over the long term is quite amazing. Putting a price on emissions will re-focus where future productivity gains will come from, but it seems likely that agriculture's past productivity performance will continue in the future.

Q. My question is for Anthea, and it is a simple question of practice or principle. Under the Australian CPRS, a cap is imposed on emissions because the aim of the Government is to reduce emissions over time. However, if you link the Australian scheme to an international scheme, and a Kyoto unit matches our emission units, does the scheme become powerless to actually reduce national emissions?

Anthea: The economic modelling associated with the Government's White Paper examined the question of how much emission reduction we can anticipate occurring within Australia, and how much will be achieved as a result of Australian businesses purchasing international emission credits. While it is useful to understand the relative importance of these different components of emission reduction, from the point of view of the globe it doesn't care. As long as there are sufficient controls in place to ensure that either a domestic credit or an international credit removes the same amount of greenhouse gases from the atmosphere, then it is still a contribution that Australia has made because a business in Australia has paid for it.

The Impact of the CPRS on the Energy Sector

Paul Balfe

ACIL Tasman

Paul Balfe is an Executive Director of ACIL Tasman, with overall responsibility for ACIL Tasman's gas business including the development and commercialisation of ACIL Tasman's GasMark model and its application to strategic and policy analysis throughout Australia and in New Zealand. Paul has more than 25 years experience in the energy and resources sectors. He has held a number of senior executive positions in the Queensland Department of Minerals and Energy. He has advised government and corporate sector clients on matters relating to the coal, oil and gas industries, coal seam methane, oil shale, mining safety and health, environmental management and alternative and renewable energies.

Thank you for the opportunity to talk at this conference today. I know a lot more about energy than about farming and therefore my focus on the implications of the CPRS on the cost of energy services should come as no surprise.

At the start of my presentation today I will provide a little bit of background on the CPRS and particularly energy and how farm energy costs and the CPRS tie together. I'm then going to talk about a study which is a little bit dated in the sense that it was put together before the White Paper came out, but I take some solace from the fact that even if we'd done it last week it would be a little bit dated. And importantly while details of mechanisms and structures and approaches have evolved and continue to evolve, I think the basic messages of the analysis that I'll present to you are directionally unchanged. It will give you, I hope, a good feel for how the CPRS is going to impact on the energy sector and particularly on the electricity sector. I'll talk a little bit about gas and give a very passing reference to liquids. We'll also look at how that then flows through into implications for the farm sector in terms of farm businesses as energy users and as uses of gas derived products such as nitrogen fertilisers.

So why focus on the energy sector in the context of this conference? Well, as I said, I know a lot about energy and not much about farming, so there's an obvious answer why I'm focusing on energy, but the real answer is that the cost of energy pervades the costs of nearly all farm inputs. For example, electricity is obviously a fundamental input factor of farm production – both directly to power machinery and equipment used in farming but also indirectly as an input into many of the inputs, many of the products that are used in farm operations. Similarly gas is a significant fuel used for electricity generation, so what happens with gas prices as a consequence of the CPRS will flow through to electricity prices, but also through to those sectors where gas is used as a major feed stock, the obvious main one being the manufacture of nitrogen fertiliser.

On the liquid fuels front, as a previous speaker has pointed out, there are transitional arrangements that will moderate the impact of the CPRS on most fuel prices for an initial three-year period. However, given the decision that the point of obligation for fuel emissions will be with the major distributors, we can expect that whether the bulk fuel that is sold is from an Australian refinery or is imported, it will effectively be carbon costed and we can expect to see that cost flow through plus or minus adjustments and transitional arrangements.

Let's just think more broadly about what's shaping energy supply, demand and pricing. Obviously, our main focus here is on the CPRS, but another key

part of what's changing the shape of the energy landscape here, is the Government's 20 per cent renewables target, which aims to have effectively 20 per cent of generated energy sourced from renewable technologies by 2020. That's quite a challenging target and I'll talk a little more about what technologies can contribute to that.

We're seeing now, as a result of existing state and federal policies, a rising demand for gas in power generation. And when we look at the available and emerging technologies, gas fired generation is typically seen as being the transitional technology to other low or zero emission bulk electricity generation technologies. There are a number of other possibilities that haven't yet been commercialised but for which great hopes are held. However at this stage, gas is the least emitting established bulk generation technology that's commercially available that is within the range of what is going to be socially and politically acceptable at this point in time. There is one other factor that's affecting energy markets generally, or potentially affecting them, which is the proposal to develop an LNG industry on the east coast based on gas out of coal seams in Queensland. You may be aware that there are a number of proposals for large-scale LNG development that are potentially going to take some of the local gas supply and put it into export markets; and that is certainly part of what's putting upward pressure on gas prices at the moment.

Let's look quickly at the 20 per cent renewables target that has been set by government because it is a very important part of the overall picture. The pie chart below shows you the existing hydro stations, the Snowy Mountains scheme and the Tasmanian Hydro and the various other hydro schemes which contribute about 15,000 GWh of energy per year.

The original mandatory renewable energy target was for another 9,500 GWh so if you think of it in terms of all the hydro electricity generation capacity currently available, that target was equivalent to about two-thirds of that. However, achieving the 20 per cent renewable energy target will require a further 35,500 GWh of renewable energy generation capacity. That is the level of capacity that will be required to achieve a total of 60,000 GWh of capacity, which would represent approximately 20 per cent of the expected nation-wide demand for electricity in 2020.

Where that 35,500 GWh of generation capacity will come from is an interesting question. There are some opportunities and some risks associated with this target. It is also important to think about what happens if that volume of renewable generation capacity doesn't emerge.

As you all know our existing electricity generation capacity utilises conventional coal and gas generators, as well as hydro generation, although hydro has limited capacity for expansion. In terms of the new entrant technologies, there is an increasing amount of wind generation capacity being developed. In our research we have assumed that geothermal power starts to become commercially available, and there is certainly a lot of work going on in that area. Solar certainly will be important, but in terms of bulk generation the

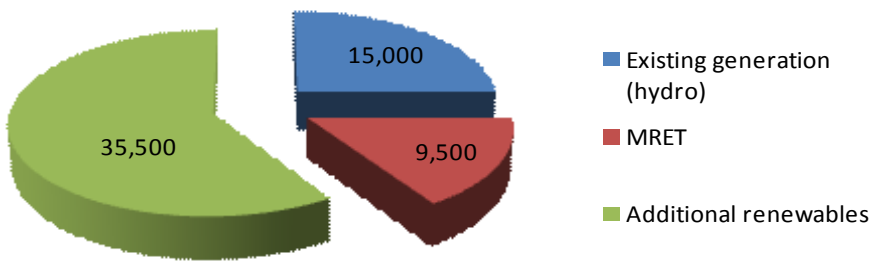


Figure 1: Impact of 20 per cent target – 60,000 GWh; new renewables target 35,500 GWh.

total amount of gigawatt hours is, and will remain insignificant. We have also assumed that nuclear power is not available in this analysis, as even if there was a major policy shift it's highly doubtful that a nuclear power station could be operating by 2020. Another possible new generation technology is Integrated Gasification Combined Cycle. This involves using coal, gasifying it and then using a combined cycle technology with carbon capture and storage. We expect that this technology would only be at a demonstration stage by 2020, and indeed we anticipate more generally that carbon capture and storage would only just be at a commercial stage by 2020.

The following graph provides a reference for the major existing generation technologies, and how much greenhouse emissions they produce. As you can see from the scale on the left side of the chart, Victorian brown coal generation produces a range of emissions from about 1.1 to 1.4 tonnes per megawatt hour, and averages approximately 1.2 tonnes of emissions per megawatt hour generated. For black coal, the dominant form of generation in New South Wales and Queensland, the average emission produced per megawatt hour is approximately 0.9 tonnes. Looking at gas-fired generation, there are two technologies available. These are Combined Cycle Gas Turbine (CCGT), and Open Cycle Gas Turbine (OCTG).

CCGT produces about 0.4 tonnes of emissions per megawatt hour and is the technology used in large gas fired stations that provides base or intermediate load power, and produces a lot of electricity. The OCTG are a bit less efficient and are the technology used to provide extra peak load capacity.

They don't burn a lot of gas and they don't have a lot of emissions because they are only contributing a relatively small but critical amount of energy during peak demand periods.

Against that background, I now want to talk a little bit about the study we did for the Electricity Supply Association of Australia, because I think it will illustrate to you what the impact of CPRS potentially is on the electricity generation sector. Our brief involved an analysis of what emission reduction targets of 10 per cent or 20 per cent (on year 2000 emission levels) would mean for the electricity generation sector. In doing that, we needed to take into account the fact that increased renewables, under the 20 per cent Renewable Energy Target (RET) scheme, would reduce the amount of electricity generated by conventional technologies in the national electricity market. The research examined both the Eastern and Western Australian markets, but my comments will focus on the Eastern Australian system because that operates as one interconnected market, whereas the Western

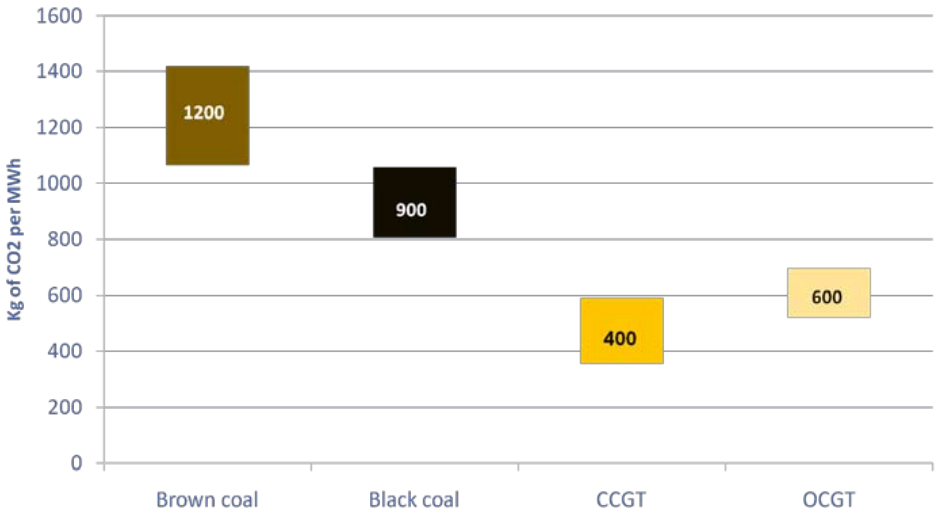


Figure 2: CO_2 emissions for conventional thermal generation technology.

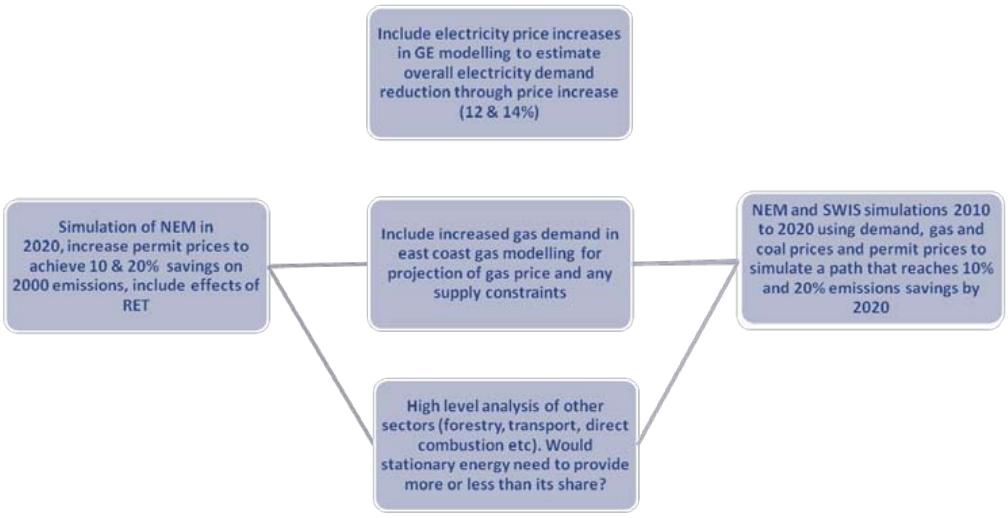


Figure 3: Overview of ESAA modelling methodology.

Australia electricity market operates as a free standing market in the southwest of the state.

I'll start by summarising what we concluded from the study and then I'll lead you through our conclusions. First of all it was apparent that a trading scheme like the proposed Carbon Pollution Reduction Scheme could be effective in lowering emissions to meet those targets. However, it would result in the retirement of some of the Victorian brown coal generators, and this is likely to be followed by retirement of the more expensive and less efficient black coal generators, and the replacement of these with gas fired generation capacity. This analysis took into account that electricity demand will be reduced through conservation and energy efficiency measures and as a response to higher prices. The results indicate that wind and, later on, geothermal generation capacity will become more significant. Other sources of renewable generation also start to be used, but only because they're mandated.

For the first pass simulation, we put into our electricity model a carbon cost that effectively changes the short run marginal cost of operation of the generators and therefore changes the prices those generators can economically bid to supply electricity into the market. The results, not surprisingly, showed that the market share of gas generators increased, the market share of coal generators decreased, and overall electricity prices increased. Of course, those results do not occur in isolation, because a change in electricity price will change demand, and that will have flow-on impacts throughout the entire economy. To study those flow-on impacts in more detail, that information was incorporated into a General Equilibrium model of the entire Australian economy.

The research examined what the increased demand for gas meant in terms of gas prices. The research also needed to examine effects in other sectors of the economy, to understand whether the electricity sector would just be required to achieve its pro-rata share of national emission abatement, or whether it would be required to achieve a greater or lesser emission reduction share based on the cost of achieving abatement in other sectors of the economy.

The conclusion the research reached was that if anything, emission abatement in the electricity sector was likely to be lower cost than in a number of other sectors and the sector would reduce emissions by more than other economic sectors. The dynamic modelling used enabled this result to be looped back into the simulation, and modelling processes continued until an equilibrium result was obtained.

Figure 4 shows the carbon price trajectories that were used, recognising this was work carried out in early 2008.

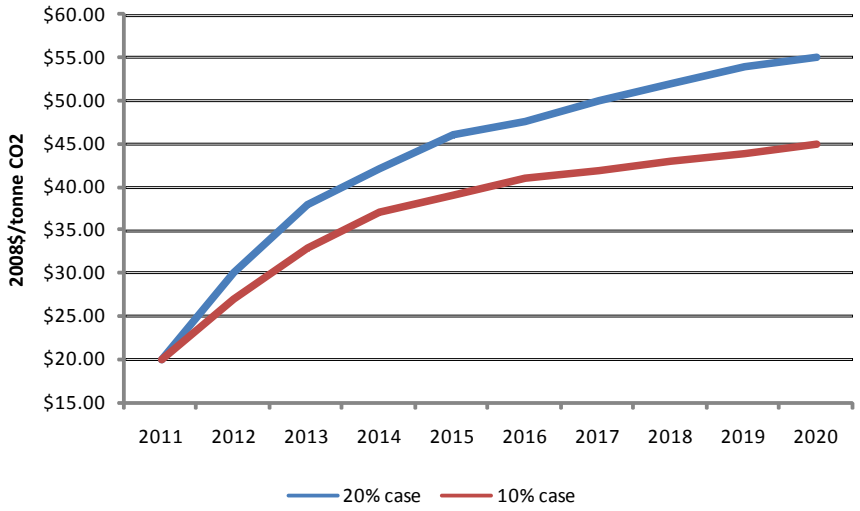


Figure 4: Modelled emissions permit prices (real $2008).

The carbon prices used in the research were $20 as a starting point, increasing to between $45 and $55 over ten years. These are the carbon prices that we determined were necessary to achieve the targeted levels of abatement. Table 1 provides some detailed results arising from the modelling.

Under business as usual with no carbon costs, it would be anticipated (using Queensland as an example) that the wholesale electricity price in 2020 would be approximately $53 a megawatt hour. With the 10 per cent emission reduction target, that increased to $79, and with a 20 per cent target it increased $88.

The results displayed in Table 2 provide some indication of the likely impact on wholesale electricity prices, which is the bulk price paid in the wholesale market by electricity retailers. When this flows through to retail prices, which is what you see in your monthly or quarterly electricity bill, the proportionate effect is muted because the wholesale price of electricity is only part of the total set of costs that are included in a consumer's electricity bill, as can be observed in the Table 2.

Nominal ($/MWh)	5 year average (2003 to 2007)	2020 (BAU)	2020 (10%)	2020 (20%)
NSW	$42.00	$71.20	$108.53	$116.84
Queensland	$33.65	$72.62	$109.07	$121.68
South Australia	$38.72	$79.05	$106.35	$110.40
Tasmania	$45.97	$78.71	$97.62	$98.58
Victoria	$34.89	$68.94	$106.75	$112.67
WA (SWIS)	$41.25	$45.08	$85.96	$92.91
Real (2008 $/MWh)				
NSW	$43.76	$51.65	$78.73	$84.76
Queensland	$35.03	$52.68	$79.12	$88.27
South Australia	$40.45	$57.34	$77.15	$80.09
Tasmania	$46.42	$57.09	$70.82	$71.51
Victoria	$36.27	$50.01	$77.44	$81.73
WA (SWIS)	$41.25	$33.52	$63.92	$69.08

Table 1: Wholesale electricity price changes resulting from CRPS ($/MWh).

	2008	2020		
		BAU	10% case	20% case
Cost of energy	5.8	7.3	9.4	9.9
Network costs	5.5	5.5	6.0	6.0
Retail margin	1.5	1.5	1.5	1.5
RET cost (20% by 2020 target)			0.9	0.9
Total	12.8	14.3	17.8	18.3

Table 2: Indicative pass through to retail tariffs (cents per kWh).

Projected changes in the wholesale cost of energy are displayed on the top line. The subsequent lines show projected changes in network costs, retailer's margins, and the cost impact of the RET introduction. It is notable that the projected costs don't vary greatly with higher carbon prices, because the wholesale energy cost is just a small component of the consumer energy cost. At the consumer level, these results indicate electricity prices of between 14 and 18 cents per kilowatt hour. How great the impact of this change is on individual businesses depends on whether the business is a wholesale or a retail purchaser of electricity.

Another element of this research that is of interest is the projected retirement of existing generation capacity. The following graph shows the projected changes in generation capacity based on a 10 per cent emission reduction target. A bar below the horizontal axis indicates a reduction or retirement of generator capacity, while a bar above this line indicates a projected increase in capacity.

It is apparent that the biggest changes will occur in Victoria with the forced retirement of brown coal generation capacity, although there will also be some retirement of black coal generation capacity in NSW, Queensland and South Australia. A similar pattern is observed under the 20 per cent emission reduction scenario, although as would be expected the projected scale of change is much greater.

These results indicate that a substantial proportion of existing coal-fired generation capacity will be retired. A lot of plants that otherwise would keep operating are projected to be closed down because it will no longer be economical to continue their operation. This capacity will be taken up by new investment in renewable and wind generation capacity, and a lot of new natural gas generation capacity, particularly in Victoria and Queensland, because they're well endowed with gas, and to a lesser extent New South Wales. By any measure, this projects that a large amount of investment will be required, and also a lot of retirement of

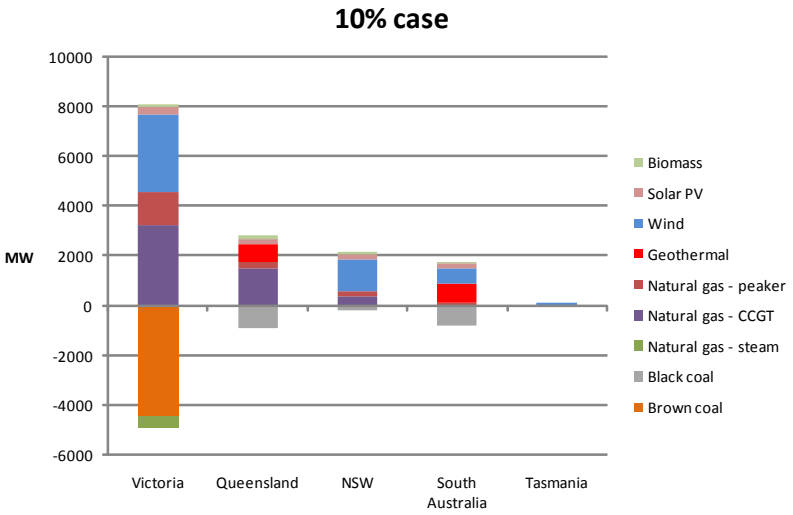


Figure 5: Generator capacity retirement and growth, 10 per cent emission reduction scenario.

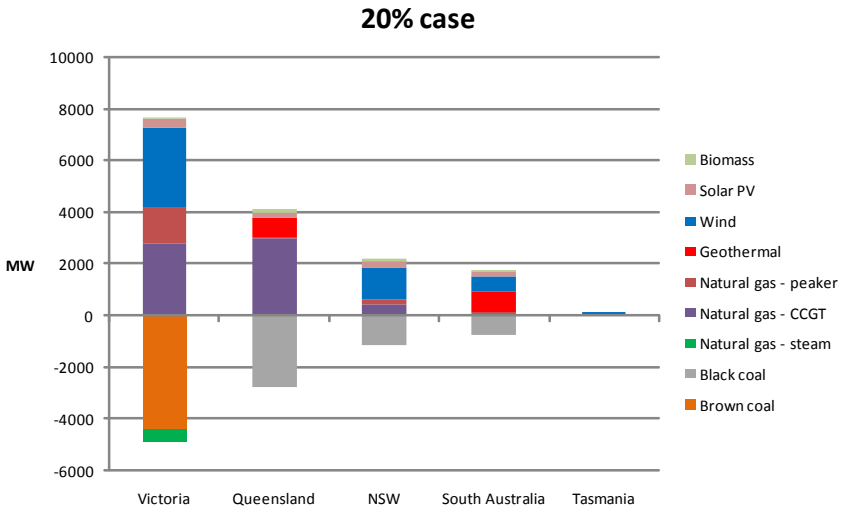


Figure 6: Generator capacity retirement and growth, 20% emission reduction scenario.

electricity generation capacity that still has an otherwise useful economic life.

To give some idea of the generation investment that will be required, in a business as usual case it would be anticipated that about $13.5 billion dollars worth of new plant investment would be required to meet growth and refurbishment requirements. Under the 10 per cent emission reduction scenario, it is projected that about $33 billion dollars of new investment will be required, and under the 20 per cent scenario, about $36.5 billion of investment will need to occur.

Figure 7 provides some details of how the mix of generation capacity is projected to change over time. As can be observed, the greatest amount of projected growth will occur in gas generation capacity, and the greatest reduction will occur in brown coal generation capacity.

In terms of overall fuel consumption for the 10 per cent and 20 per cent emission abatement cases, it is projected that the total amount of fuel will reduce very significantly. What allows that reduction is demand side reduction and a greater contribution of renewable generation capacity (Figure 8).

These graphs indicate that either the 10 per cent or the 20 per cent emission reduction scenario show a reduction in fuel use of about 700 petajoules, compared to what would be the case under business as usual by 2020. Seven hundred petajoules is about the size of the current entire Eastern Australian gas market, so this is quite a large challenge. To the extent that there's any shortfall in meeting the renewables target, that's likely to need to be made up by gas. It implies a lot of opportunity but also a lot of pressure, on gas production (see Figure 9).

Figure 9 provides the projected emission by state, and it indicates that Victorian emissions will need to reduce by a very large amount.

The interesting question is how will these changes impact electricity and gas prices? When CO_2 emissions have a price applied to them, it pushes up the operating cost of all fossil fuel generators, but not equally. For example, for the combined cycle gas plant, a $10 carbon price will add about $4 per megawatt hour to the price of electricity, but would add $11 or $12 to the price of electricity generated by a Victorian brown coal generator.

On the revenue side, it will also push up the average electricity prices that the generator receives, so the generator will benefit on the revenue side, but that's likely to be about $6 to $8 per megawatt hour. The result is that for the gas fired generator, costs have gone up by $4 per megawatt hour, revenues have gone up $6 to $8 per megawatt hour, and they are therefore quite happy. For the brown coal electricity generator, the more they generate the more money they lose.

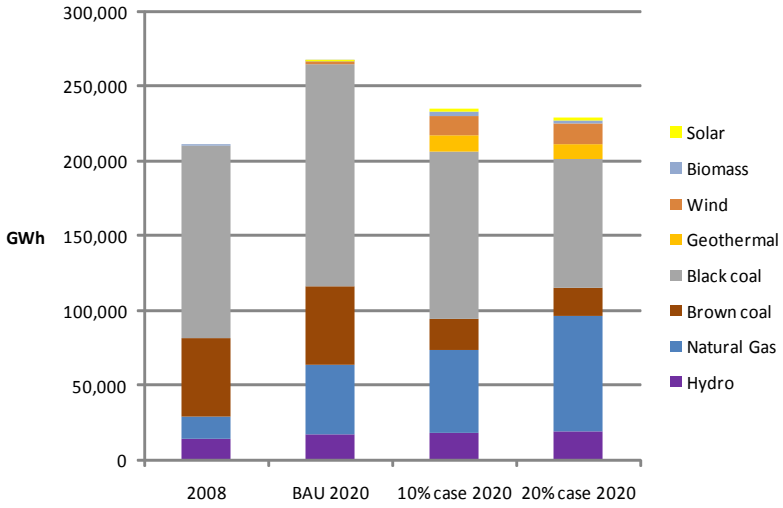


Figure 7: Projected changes in the mix of generator capacity over time.

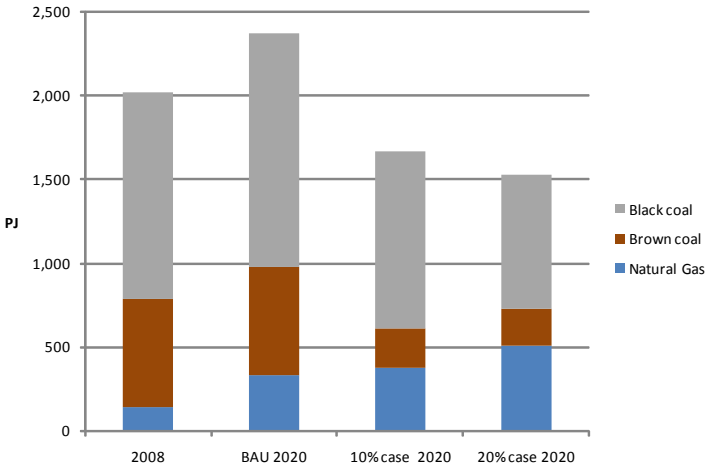


Figure 8: Fuel sources for electricity generation.

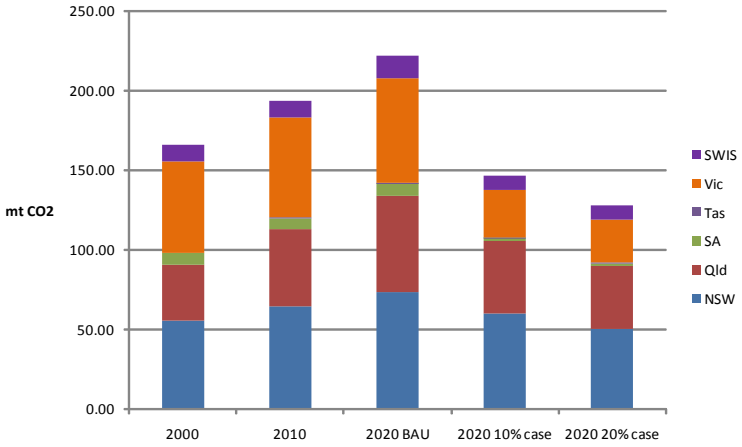


Figure 9: CO_2 emissions in the BAU, 10% and 20% cases.

Gas prices will be significantly impacted by the CPRS. Our projections indicate a nominal gas price in excess of $10 per gigajoule by 2020. The current wholesale gas price is around $3.50 a gigajoule, so this result projects a significant uplift in gas prices. The following graph shows how the research projects that gas prices will change in real terms in each state.

In summary, the CPRS is going to have a profound impact on the patterns of electricity generation in Australia. Our research projects that three out of the four Victorian brown coal power stations will close. Over a bit longer period of time we project that South Australian coal-fired electricity generators will also close, as will some of the black coal electricity generators in New South Wales and Queensland. The research results also project that the compensation arrangements that have been proposed for the electricity generators won't change that outcome. They may alter the timing of the closures somewhat depending on the final decisions, but certainly the compensation won't keep those power stations running.

A lot of the replacement and growth in generation capacity will be in the renewable sector; a large amount of gas generation capacity will also be required, and there will also need to be a lot of open cycle gas generation capacity that remains un-used for most of the time. This capacity will be most needed for those days when electricity demand is at its highest. These are those stinking hot summer days when there is no wind, and when these days occur, there is no wind right across south-eastern Australia, and this is when the wind generators don't turn. For those times there will need to be a large amount of gas generation capacity that can be switched on quickly.

As for farm businesses, the CPRS will certainly increase the cost of energy and that will flow through to increased farm costs, especially for electricity. All other farm inputs that use energy in their manufacture, and especially fertiliser and other products that use gas as a feed stock, will certainly increase in price. It will not just be the CPRS driving this, as there will be other pressures on gas prices and availability that will also contribute to an increase in prices. An interesting question will emerge quite quickly, because for products such as nitrogen fertiliser the quickest response would be to import it from a nation without a carbon policy, because it will cost less from this source. That raises the question of whether the Australian Government might be forced to implement some form of carbon tax on specific imports, in order to prevent carbon 'leakage'. We are certainly in for an interesting period.

I think that will do it from me. Thank you very much.

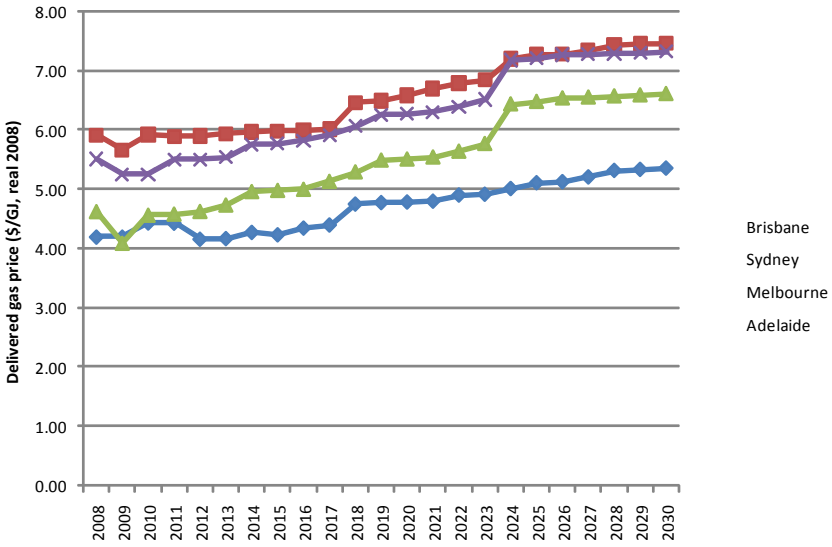


Figure 10: Projected changes in gas prices over time.

Implications of the CPRS for Australian Meat and Dairy Processors

Robert Poole

Murray Goulburn Co-Operative

Robert Poole is General Manager Industry and Government Affairs Murray Goulburn Co-operative. In this role Robert is responsible for major new projects aimed at increasing sustainable milk supply. Furthermore Robert is responsible for the management of emerging sustainability issues including environmental issues and access to key farm inputs. Robert is managing trustee of his family's dairy farm business in northern Victoria and also supports the family's wheat and sheep operations. Completing his Bachelor of Agricultural Science in 1991, Robert was also admitted to the Degree of Master of Business Leadership at RMIT University in 2005.

Thanks very much for the opportunity to speak to you today. As many of you would be aware, I work for Murray Goulburn Co-operative, one of the biggest businesses in Australia and 100 per cent owned by dairy farmers. As a business that is 100 per cent farmer owned, anything that happens to Murray Goulburn happens to our dairy farmer suppliers and happens to the whole dairy industry, because Murray Goulburn fundamentally set the milk price in Australia. The Co-Operative was formed in 1950. Murray Goulburn has 2,700 suppliers and 2,500 employees, mainly in rural areas. Murray Goulburn is certainly a big driver of economic activity in some of the big country towns in Victoria and our site in northwest Tasmania. The Co-Operative processes about 35 per cent of Australian milk through our various sites. Murray Goulburn is Australia's number one exporter of processed food. The Co-Operative is also the largest containerised exporter out of the Port of Melbourne, so, next time you get asked that in a trivia contest, you know the answer. Murray Goulburn is a little old dairy company doing $2.6 billion in turnover and $1.6 billion in exports. It's a huge business but it is really 2,700 small businesses, the businesses owned by our dairy farmer suppliers.

I would like to reinforce a couple of key messages for you before I get into the detail. Firstly, be careful of what I might refer to as the research and development trap. In the past, governments have been very good at saying that they are going to impose this regulation or tax on an industry, but will also provide some extra research and development (R&D) funding to help the industry improve productivity and adjust to the impact of the measure. Some governments have not always delivered on such promises, so it is very important that such offers are carefully considered. This is not to say that offers or R&D funding should be rejected as we will certainly need increased investment in this area, and I note the Australian Government has recently made $50 million new R&D commitments, which is a good start.

However, let's put that in perspective. Murray-Goulburn alone will be writing out a cheque for at least $20 million per year in emission costs and extra energy costs, and there are plenty of other agribusiness companies faced with similar costs. Viewed from that perspective, the extra R&D investment is a good start, but only a start. That is the reason I think the industry should be careful about engaging in a debate about whether another couple of million dollars a year in research funding would be sufficient. What agriculture really needs is for the Government to develop policies that will allow us to remain internationally competitive, particularly until the world catches up. What

agriculture needs is 100 per cent free emission permits, until the world catches up. That is the only policy that makes any logical sense, and it's the only policy that will actually achieve any positive results. It is also the policy that Professor Garnaut recommended, for very good reasons, and it is the policy the sector should insist on.

In saying this, let me reinforce to you that this policy position is not an anti climate change action position – it is actually a position that will generate the best outcome for the environment. Professor Garnaut didn't recommend free emission permits for exporters economic reasons; he recommended them for environmental reasons. The Greens and environmental groups should actually support free permits for trade-exposed sectors because any alternative is just a recipe for carbon and economic leakage, and an increase in global emissions.

Let me just reinforce that point. I'm not against taking action on climate change, and I'm not anti the CPRS – not at all. I think taking action to achieve long-term objectives, as other speakers have talked about this morning, makes a lot of sense. But it makes absolutely no sense if Australia acts early, and adopts policies that kill some of its major export industries in the first ten years, and increases global emissions into the bargain. Australian industry should proceed down the CPRS path, but it is absolutely critical to provide comprehensive industry support for the first 10 or 15 years until the world catches up.

Murray Goulburn takes it's environment requirements seriously. The Co-operative is covered by fairly strict legislation in Victoria, in terms of the effluent and energy management investments that have been made. The organisation has also done a couple of really great things, over and above our legislated requirements. One of the things we've done is pioneered liquid natural gas in our transport fleet, and it is something that we'd like to do a lot more of, but unfortunately the infrastructure is not there to do it. Murray Goulburn has also achieved major efficiencies in water use. At our Leongatha site we greatly reduced our water use, and that change in effect added 25 per cent to the size of the local water storage facility, saving the community a great deal of money.

Murray Goulburn utilises a large amount of energy, and is in the top 750 companies that are required to report under the National Greenhouse and Energy Reporting System (NGERS). The total emissions footprint of the organisation is an estimated 690,000 tonnes of CO_2-e, with this predominantly from electricity, gas, steam and diesel use. We do produce a relatively small amount of emissions from our effluent dams that are used as part of our waste treatment systems, although we have become pretty good at taking the good stuff out of dairy products now, so our waste streams are down to about two or three per cent. In the old days we used to just take the good stuff out and then give the whey protein to the pig industry. Murray Goulburn doesn't do that now. We make whey protein concentrate and other products and sell that as well.

Murray Goulburn is a major energy user, but let me explain the problem. By the legislative definition, the organisation is only moderately emissions-intensive. The organisation produces about 300 tonnes of CO_2 equivalent, per million dollars of revenue. Those of you who are familiar with the thresholds for free permit allocation under the emissions intensive and trade exposed (EITE) arrangements of the CPRS would realise that the minimum threshold for free permits is 1,000 tonnes of CO_2-e per million dollars of revenue or 3,000 tonnes per $1 million in value added, so Murray Goulburn is not even close to being allocated free emission permits on a company wide basis. The option exists to look at EITE eligibility at an activity level. Murray Goulburn did some work with Ernst & Young and Dairy Australia, and examined our most emissions-intensive group of products, which are our dried milk powders. Those analyses showed they result in the production of 600 tonnes of CO_2-e on a value added basis. We had to get to 3,000 CO_2 on a value added basis to be eligible for any free permits, so even for the most emissions-intensive products, Murray Goulburn is not eligible for any free emission permits.

So Murray Goulburn is left in this no man's land of being fully trade exposed, but only moderately emissions intensive. So that's going to be about a $15 million dollar cheque for Murray Goulburn at $23 a tonne CO_2-e, and if the carbon price goes

higher, obviously the cheque gets bigger. The Co-Operative is going to have to establish systems and begin trading in emission permits to cover about half of our emissions. The other half of the Co-Operative's exposure is through the pass-on costs we will experience from our electricity suppliers.

Because Murray Goulburn is fully trade exposed we basically can't pass through any of that cost to the consumer. The Co-Operative doesn't have a big position in the liquid milk market in Australia. Most of the products marketed by Murray Goulburn are either freely imported into Australia or are marketed by Murray Goulburn into export markets. As a result, Murray Goulburn can't pass on any extra costs.

Now the bigger problem is of course is that cost doesn't actually stop with Murray Goulburn. Murray Goulburn is just a group of dairy farmers, so all the Co-Operative can do is reduce the price it pays to its dairy farmer suppliers. At the very start of this scheme, notwithstanding the cap of $10 a tonne on emission prices, the cost will equate to between $5,000 and $10,000 per dairy farmer per year. Just in case you are a bit confused, that is only the cost of Murray Goulburn's factor emissions, without even talking about the potential cost of permits associated with direct farm emissions.

While long-term modelling of the economic costs of the CPRS are all very well, the real challenge lies in understanding the likely costs of the scheme during the early years, and I don't think the agriculture sector has examined those costs in sufficient detail. Despite pronouncements that agriculture will remain 'uncovered' until 2015, many of the major processors will be required to participate in the CPRS, and this applies in the dairy and meat industries, some of the food processing industries, and in the sugar industry. In virtually every case, processors are fully trade exposed, and they have no option other than to pass the costs back to their farmer suppliers. In the meat industry, I have heard an estimate that the cost will be $4 to $5 per animal slaughtered, or about that amount.

Murray Goulburn is one of the 750 companies that have to report each year under National Greenhouse and Energy Reporting Scheme (NGERS). As I mentioned earlier, the total emission footprint of the Co-Operative is about 690,000 tonnes of CO_2-e per annum. About 75 per cent of those emissions are invoice based – meaning that they are associated with our use of electricity, gas and fuel. Of the other 25 per cent of our emissions, the biggest source is specific contracts which we have to generate steam and that's proven pretty complex because it's a third party that we're dealing with, only providing energy to us as a company. There is also some fugitive emissions from our waste water, refrigerants etc – all fairly minor amounts that are a bit complicated to calculate. But, all in all, it's not been too hard to comply with the NGERS, once we have established the systems. Having said that, getting the system set up has been a very big process. There is a reasonable cost but, even for a big company like Murray Goulburn, it's not too hard to do.

The Co-Operative will meet its obligations by the end of the financial year. Audit costs are going to be pretty substantial, however, with early indications being that it could cost us $100,000 – $150,000, just to be audited for NGERS and we're probably going to spend another million dollars a year on meeting other things like our energy metering requirements.

As part of the process of trying to apply for EITE status, Murray Goulburn closely examined the emissions associated with different activities and processes. The Co-Operative makes hundreds of different products. Depending on the categorisation system used, you could say that that Murray Goulburn has 1,800 products. In looking at the full range of products, it was apparent that only our most emissions intensive products might meet the eligibility requirements, and those are our dried milk powders. Unfortunately, as I mentioned earlier these products do not meet the EITE eligibility thresholds, and therefore will not trigger free permit eligibility. However, in carrying out that process it became apparent that, in future, Murray Goulburn will need to be able to measure and report emissions and energy use virtually at a product level, but certainly at an activity level. This will be especially the case if life cycle analysis of a products energy or emission footprint becomes more prevalent in the future.

As a result, we have now recognised that we will need energy sub-metering in our factories, and especially on all our new items of capital expenditure. So if we replace something in our factory of a major nature, we make sure that any new equipment has a meter on it, so that we can actually measure the energy use associated with that product. Installing metering is a multi-million dollar exercise for Murray Goulburn over the next 5 to 10 years. Along with that, there will be a need for much more sophisticated computers and IT systems, and Murray Goulburn is committed to that investment.

Just on that theme, I think we're committed to a lot of things regardless of what happens with CPRS in Australia. I've been quoted as saying, the die is cast, we are going to have to be much more accountable in our energy use and our environmental systems, and there will be no turning away from that direction.

I wrote this speech a couple of weeks ago, and I didn't realise at that time that the timetable would be delayed effectively 2 years, as per a announcement of the past few weeks. We've got quotes from consulting firms who are going to help us do a lot of planning on how we respond to the CPRS depending on its final design. However, knowing the political situation that has all been put on hold, so all of our major business planning, we've got sitting there, ready to go, but we haven't actually done it. It now appears that we've probably got another couple of years to prepare for the CPRS, and given the state of the dairy market, I'm sure my boss would be happy that I didn't go ahead and spend that money.

Murray Goulburn is committed to emissions reduction and, as I say, I think the die is cast and that all of us will need to move in that direction. However, I don't think that the CPRS is the real driver of this change. We see it more as an added cost than a driver of change because I think we're going to have to improve our energy efficiency, we're going to have to reduce our energy costs, and we're going to have to start to look at renewable sources of energy. Murray Goulburn has identified major projects which do that, but to be honest these projects are just at the R&D stage today and it will be 10 to 15 years before they deliver results and can be implemented. That's why supporting Australian export industries over the next 10 to 15 years is critical. I agree very strongly with the notion of long term targets, a soft start, and then an increasingly hard finish. I think Professor Ross Garnaut said it well – you actually will get a bigger response out of industry if you give them a soft start with some clear objectives.

We do absolutely support what Ross Garnaut said about these issues, when he said that trade-exposed sectors need to be protected until there is a comprehensive global emissions trading agreement. That is what he said, and he didn't talk about any cut-offs based on emissions intensity. I believe these EITE thresholds are the worst aspect of the legislation. The policy really does create the haves and have nots now and they'll literally ensure businesses just under those EITE thresholds get absolutely no assistance whatsoever. As a consequence, the cheque Murray Goulburn will write for $20 million bucks in 2012 is going to be bigger than the cheque written by businesses that are much bigger polluters.

As I said earlier, what we really need in terms of policy in Australia is a level playing field. Fonterra in New Zealand is our biggest competitor in the world. They've negotiated an arrangement under the New Zealand ETS where they can opt into the scheme from 2013, and get 90 per cent of their required permits for free, based on a 2005 baseline production level, which has since declined. In comparison, Murray Goulburn gets no free permits, and will have to start paying for emissions two years earlier, in 2011.

Murray Goulburn is moderate in terms of emissions intensity and highly trade exposed. This means the Co-Operative is in the worst possible situation, and the cost will quickly be transferred to our farmer suppliers once the CPRS commences. As a dairy farmer myself, I perhaps could be convinced of the value of writing the cheque out, if I thought it was actually going to reduce global emissions. However, based on our understanding of the legislation, I would have to say this is far from certain.

We believe that the food processing sectors such as meat and dairy processors should be considered as part of a whole supply chain, and treated in a similar way to what is proposed in New Zealand. In other words, the dairy and beef sectors meet the criteria of being emissions intensive and trade exposed, and so therefore the supply chains which are associated with those sectors should be covered in that same way. It's no good just leaving these sectors out because we will be facing increases in the cost of electricity and energy inputs, so processors will actually have to receive free permits if we're going to protect this sector.

I'm very confident about energy into the future, over the next 50 years. I think we are about to experience an energy era similar to what we have experienced in computers and IT over the past decade. The result will be a dramatic change in what we consider to be a normal source of energy. But I'm not as confident about the stability of the world, and the capacity for agriculture to increase its output. Sensible and workable CPRS policies and a substantial increase in agricultural R&D investment are the best tools we have to to make sure my concerns are unfounded.

Thankyou.

Panel Session: Paul Balfe & Robert Poole

Q. A question for Paul about the wind turbines which are desecrating landscapes all around the world. Presumably there's a carbon cost in the manufacture and installation of those. Assuming a sort of average production of energy and transmission losses, how long it is before they're sort of carbon neutral?

Paul: I don't have an answer for you, but you're quite right. If you look at the full life cycle, wind turbines are not zero emitting. Once they're up and running, however, they have no fuel costs and they create no emissions beyond that point. I don't have the numbers on what carbon emissions are produced or energy is utilised in their manufacture, but there certainly will be energy consumed and emissions generated in that process.

Q. You mentioned those stinking hot days in Victoria and South Australia. I would have thought that would lend itself to solar electricity generation but you seem quite dismissive about solar as an alternative energy source. Why is that?

Paul: It's basically one of scaling. I'm sure there will be some very substantial improvements both in solar thermal and photovoltaic's efficiency. However, even the largest of the solar thermal installations that we're seeing now, when we look at the actual gigawatt hours that they're capable of producing compared to what the total gigawatt hours per year task for Australia let alone internationally is, the capacity simply is not there. We can cover every available square inch with solar thermal now and we might get there. There have been massive developments; I think the largest of them is in Spain. But when you look at what the total output is and what the capital cost is, it is simply not an economic option. The economics of all of these renewable technologies will improve over time. We know their cost will come down, but at the present time we're looking at solar technologies probably costing between $90 and $130 per megawatt of installed capacity, as against say $45 for a combined cycle gas generator, so at this stage there's a huge cost gap. There is a lot of research and development going on and eventually that gap will close and solar will make a bigger contribution. We factor a bigger contribution from solar in our future energy modelling, but in terms of the absolute amount of energy generated rather than the capacity installed, it's just a huge amount of energy that is required and these things don't produce very much of it, even a large installation.

Q. Just looking at the construction and the operation inputs that would be required to shift our energy generation from reliance on coal to more greenhouse gas friendly methods of generating power, what's the feel in terms of national employment? I mean we're hearing a push back against the current ETS on the grounds of job losses. So if one was to look at the shift in employment if coal is no longer the primary energy source, we've got the coal, we've got the mining sector, we've got the power generation. I mean what's the feel in terms of the overall effect it is going to have on employment?

Paul: Thanks that's a great question. It's very much a question of direct and indirect effects on employment. And yes, if we shut down existing power stations and build new ones we'll obviously create some transient employment in the construction sector. We'll continue to see people employed in gas production rather than coal production though the capital versus labour intensity will be different in each of those sectors. I think probably the bigger question which goes to ultimate employment effects concerns the economic efficiency and the deadweight cost of premature retirement of generator capital. That has an efficiency cost on the economy which is directionally adverse for economic activity and therefore for labour. So it's a complex question that doesn't have a simple answer.

Simplistically, building any project gives a short-term positive economic impact, but over the longer term it only does that if that project is economic in its own right. If not, it's diverting capital and labour from other more productive activities and that's I guess the risk that we face here with the deadweight cost involved in premature retirement of the existing generation plants.

I mentioned the need to back stop wind generators, because there's not a great diversity in normal prevailing wind conditions across the regions where the turbines have been established. There are certain geographical zones in which you tend to get good wind sites but if the wind's not blowing in western Victoria, it's probably not blowing on the York Peninsula either and so you've almost got to have a redundancy built into the system and that's got a capital cost.

Robert: I couldn't help but laugh when I heard the Government announced the delay in the CPRS commencement date, and immediately a spokesperson from a group setting up to do emission trading said how devastated he was that all the new jobs for traders and auditors would not eventuate for some time. To me, that's just the most insane argument you could ever make. The CPRS will make the businesses in Australia higher cost, and less competitive. And you need only to look at economies such as England and Ireland and how they have been hit by the Global Financial Crisis to understand what happens when an economy is artificially inflated by subsidies and work is created shuffling paper but not adding any value. Australia's competitive advantage is going to be in agriculture, in mining, some manufacturing, tourism and you know we've got to protect those sectors or else wealth will decline in Australia, it's as simple as that.

Emission Accounting: What are the International Rules Applicable to Agriculture?

Ian Carruthers

Australian Government Department of Climate Change

For more than a decade Ian Carruthers has had a leading role in advising on national climate change policy development and implementation of greenhouse response programs. He has played a key part in international climate change activities, including the UN Framework Convention on Climate Change (UNFCCC), the Kyoto Protocol and the Intergovernmental Panel on Climate Change (IPCC). He currently provides senior executive leadership in the Department of Climate Change on policy and program activity relating to climate change science, climate change impacts and adaptation and rural and regional Australia.

My talk today deals with the issue of greenhouse emissions accounting, and the rules associated with emission accounting under the Kyoto Protocol. I think pretty much everybody in this room fundamentally understands that if you want to have effectively functioning markets you need to be able to measure the commodity that you're going to be trading, and you need to have sound accounting frameworks. If we're thinking about carbon markets as people have been describing in some of the addresses so far, exactly the same situation applies for a carbon market. There has to be rules to define the commodity being traded, otherwise the market simply will not function properly.

In talking about the rules for counting emissions under the United Nations Framework Convention on Climate Change and the Kyoto Protocol as they apply to agriculture, I think I'm going to give you a slightly dismal picture. However, just so we don't stay in that dark space, I'll try and give you some sense about the future where I am indeed considerably more optimistic. Despite the challenges, I think that there are solutions for the purposes of a Carbon Pollution Reduction Scheme and any other approaches you might want to think about in relation to agriculture and the climate change response that might be required of the sector.

In thinking about how we count emissions associated with agriculture, first of all we need to think fairly carefully about the characteristics of the industry we're dealing with. I want to really make the point that from the viewpoint of emissions measurement and accounting, there are some quite important differences between the agriculture industries compared to some other industries. The agriculture sector constitutes a very diffuse source of emissions spread right across the landscape. We've also got between 100,000 and 150,000 business entities, many of which produce relatively small amounts of emissions. We also know that the sector operates in a great diversity of different environments and geographic locations right across the entire Australian landscape, from the tip of Cape York to the most southern point of Tasmania. Contrast this with the stationary energy sector, which consists of a small number of large, point-source emitters, located in a small number of locations.

Adding to the complexity of agriculture, we also encounter the reality that these businesses are simultaneously sources of greenhouse gas emissions, and also sequester greenhouse gases from the atmosphere in agricultural soils and trees. Just to add to the complexity, emissions and sequestration are both affected by both the land management practices of people, and also the natural variations that occur in climate from day to day, and year to year.

There is not anything like that variability and complexity in the electricity industry. There is certainly variation in emission outputs year on year depending on fluctuations in the economy, but they're pretty small percentage changes. There is also a fairly specific relationship between activities in that industry (burning a tonne of coal) and emissions, and quick responses in the event that changes are made. In contrast, a change in management in agriculture might only produce a slow response, which varies over time and distance, and may involve a considerable lag period before emissions or sequestration rates change.

Against that background, let's begin thinking about accounting systems for agricultural emissions. As in financial accounting, there is a set of international rules that specify what can and can't be counted as emissions or sequestration. In the case of greenhouse gases, the accounting methodology has been established through the United Nations Framework Convention on Climate Change and specific accounting rules under the Kyoto Protocol. These accounting rules are not doing Australian agriculture any great favours at the moment, I'd have to say. This has occurred because of the politically difficult, confused, and somewhat uninformed history of the debate about whether to include what are referred to as the land sectors in international climate change responses, and how to do it.

One of my messages this afternoon in terms of international accounting for the land sectors, the UN framework needs to do this a whole lot better in the future.

The very first point that needs to be made is that accounting for emissions and sequestration on agricultural land is split between two different 'sectors' as defined by the UNFCCC. These are the Land Use, Land-Use Change and Forestry (LULUCF) sector and the Agriculture sector. Each of these sectors has different accounting 'rules' despite the fact that they potentially deal with emissions and sequestration on the one area of land. This means there is incomplete coverage of the land sector, and changes in emissions and sequestration are dealt with on a fragmented basis, rather than via an accounting system that is comprehensive and consistent.

Let's talk specifically about the Kyoto accounting, because as we heard this morning, Australia's ratification of the Kyoto Protocol means it's the Kyoto rules that are forming the foundation for the introduction of the CPRS. Having said that, how the CPRS may evolve in the light of new international accounting approaches that might be negotiated as part of the Copenhagen negotiations is uncertain. Presumably, the Australian Government will change the CPRS to align with future international accounting requirements.

What are the accounting compartments at present, for the purposes of Australia's Kyoto Protocol obligations? For a start, what is reported under the category 'Agriculture' by Australia is not all the emissions that arise from agriculture; it's only methane and nitrous oxide emissions. These are important gases because methane is 21 times more powerful than CO_2, and nitrous oxide (NO_2) is 310 times more powerful than CO_2 as a greenhouse gas, so even small amounts of these gases add up to a lot of carbon dioxide equivalent emissions. The emissions and sequestration reported under the category 'Forestry' refer only to changes that are occurring in new forest areas that have been planted since 1990 on specific lands and these can be either commercial or environmental plantings.

What about emissions and sequestration occurring across the broad landscape? Well the Kyoto Protocol as an afterthought also allowed the inclusion of broad land classes, croplands, grazing lands and forest management; and a nation can elect whether or not to include estimates of emissions and sequestration under these categories as part of a national commitment. The Australian Government decided not to do that. The Government went through a risk analysis, then a

national consultation process and concluded that it simply wasn't in Australia's best interests. Whilst Australia had the objective of a comprehensive approach for greenhouse accounting for the land system, the Kyoto Protocol greenhouse accounting rules had the potential to get us into a whole lot of trouble due to risks associated with natural disturbances in the landscape and inter-annual climate variability. The very real risk existed that if there was a major drought or a bushfire, Australia's national greenhouse inventory would report a large surge in emissions, which the nation could be liable for depending on timing.

The UN land sector accounting approach hasn't been consistent over time. Under the UNFCCC in the early nineties, an accounting system was being developed which was reasonably sensible and comprehensive. It included some good accounting methodologies to smooth out inter-annual variability but then when the Kyoto Protocol was being negotiated, things got very political. As a result, accounting rules were developed with more of a focus on which nation would be advantaged or disadvantaged, than on making sure they were sensible and comprehensive.

How much do factors like inter-annual variability in the landscape matter? To provide some idea, the following graph is a carbon account for Australia's national croplands. What you can see is that in some years, croplands are a net source of emissions, in some years croplands are a net sink, the situation swings wildly and the emission numbers are big. For example, in 2002 Australian croplands were estimated to have emitted 40 million tonnes CO_2-e of greenhouse gases, but in 2006 Australian croplands were estimated to have sequestered almost 60 million tonnes CO_2-e from the atmosphere.

Those peaks and troughs are about a quarter of total national industrial emissions, and are caused by the natural climate drivers that we are all too familiar with in Australia. The drought in 2002–03 resulted in an enormous loss of carbon from the landscape, which is then rebuilt and replaced in the landscape once a better season occurs, such as 2005.

So what does that mean then for Australia's national greenhouse accounts? The second graph shows the reported national greenhouse inventory for Australia (yellow line), and the inventory as it would appear if Australia included Kyoto-Protocol compliant greenhouse accounting for the whole land system. This really highlights the impact that accounting for grazing lands, forest lands and croplands could have in the national emission accounts, based on current Kyoto Protocol accounting rules.

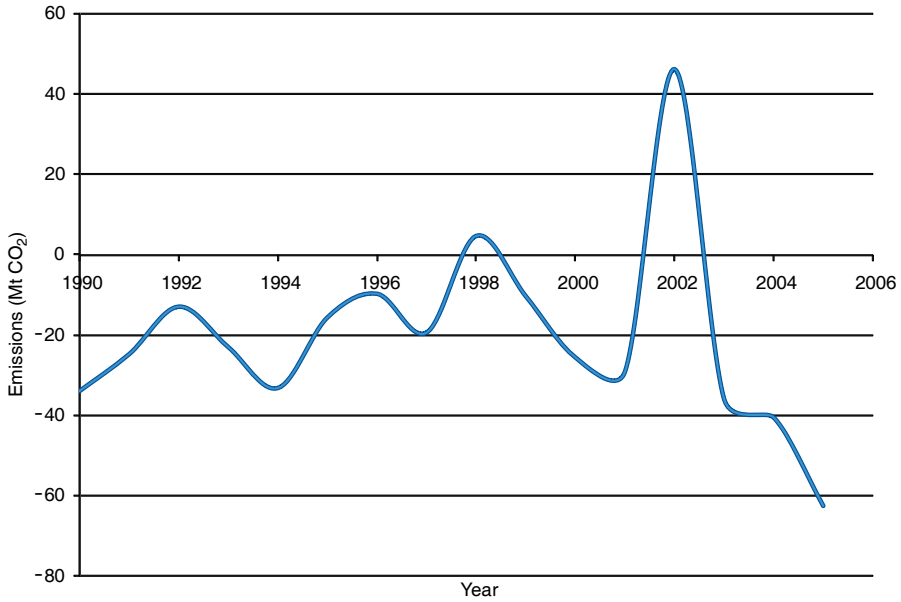


Figure 1: Carbon account of Australian croplands.

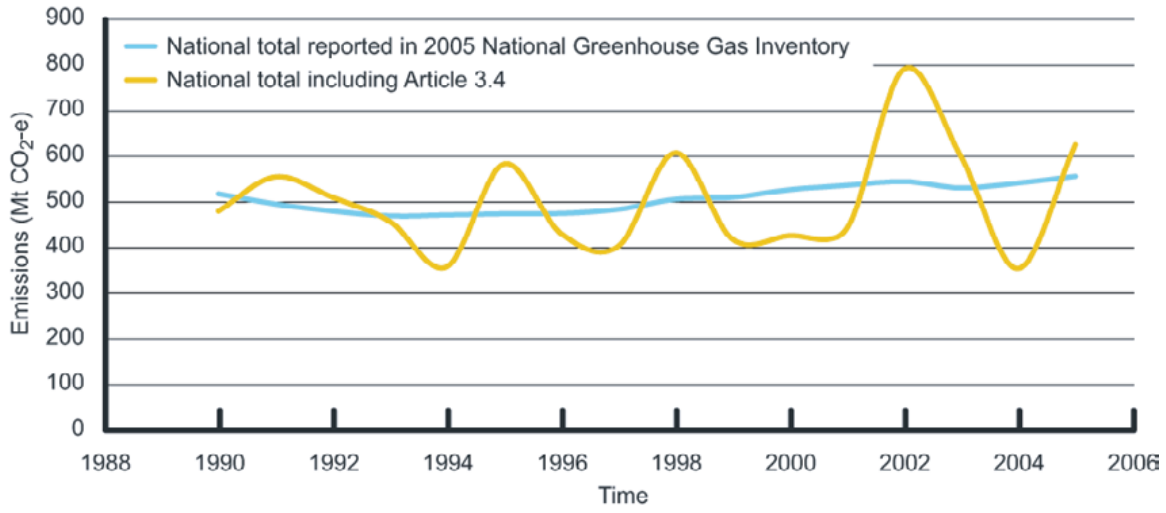


Figure 2: Implications of including Article 3.4 items in Australian greenhouse inventory.

What this tells us is that for a nation like Australia, the landscape is a big factor in the nation's reported greenhouse emission inventory. This reminds us that there is one thing Australia has, which is a lot of land. In fact we have 760 million hectares of land, and we only need to change carbon stock levels over time periods by relatively small amounts to get some fairly big changes in the national greenhouse inventory.

The obvious question is, how do we get smart about accounting for that and can we apply systems of land management that will turn this into opportunities for landholders?

The Australian Government is attempting in international negotiations to achieve a much better accounting framework that is more sensible on a global basis and much better suited to Australia's circumstances. Firstly, Australia is seeking that the accounting approach to be used should concentrate on what the UN Convention calls anthropogenic emissions, that is, human induced emissions. Australia wants a separation between those emissions and sequestrations that are the result of human decisions, and those that are caused by factors outside of human control like climate. Secondly, Australia believes that the international accounting framework should entail a comprehensive approach to accounting for carbon changes in the landscape. Australia does not support the current fragmented and incomplete system of greenhouse accounting for land sectors.

The negotiations associated with these issues are already underway, and I am hopeful that there will be a positive outcome from these.

In relation to factoring out natural disturbances, Australia has put forward specific proposals. These would mean that in relation to major natural disturbances, a nation should have available an option to isolate those affected land areas from national emission accounts for a period, as long as this was done in an honest and 'symmetrical' way. For example, in the case of the major bush fires in Victoria in 2009, it should be possible to excise the emissions associated with those lands from the national greenhouse account for a time period, but that would also mean that Australia receives no credits from the regrowth of the forests in future years. The nation would need to wait until the forests grew back to a normal state, before again bringing them back into the national accounts.

Similarly, in order to smooth out inter-annual variability, a preferred approach would be to have rolling averages for land sector emissions, rather than being forced to report highly variable annual totals that would say little about the actual emission trends being experienced.

The accounting rules are clearly a major issue to resolve, but not the only one. A related issue is the fact that you have got to be able to measure the commodity (greenhouse emissions) that will be traded under an ETS. Australia has heavily invested

in this since the time of the Kyoto Protocol, and has developed a detailed national carbon accounting system (NCAS). That system works by integrating remote sensing data on the landscape, from which is calculated a spatial or digitally specific set of carbon accounts for the landscape. This is set up to be used in the new carbon market system and should be able to accommodate landscape changes such as local farm management practices or regional strategies.

Essentially the system contains data on the state of the land cover obtained through remote sensing. NCAS includes a whole lot of data for each land unit across Australia, including data on the climate, the soil, vegetation and so on, all of this at a sub-hectare level, so it's highly specific. It consists of more than 10 billion grid cells across the continent, all of which are being modelled, with annual data going back to the beginning of the 1970s. Then hooking all of that together in the centre is information about the management practices on the particular land units and hooking that up into a computer model which generates the carbon accounts at the sub hectare scale right across the continent. The data has all been verified in the field. This same data is subject to independent UN audit on an annual basis and, let me tell you, that's one pretty tough set of auditors to have come and look over your books.

In a nutshell, Australia's national greenhouse accounting system provides a continental-scale account of greenhouse emissions, with that continental account built up from a highly detailed digital account of the continent. This enables the system to provide data at a regional or even a farm scale. But the system is not complete in terms of that capacity at the present time. Priorities have been been directed at Australia's Kyoto mandatory reporting requirements, so the focus has been on land clearing, and on the new forest plantings. In the process, the system provides information about agricultural lands in terms of CO_2 and soil carbon. What the system doesn't incorporate as yet are nitrous oxide emisions from pastures and fertilisers, and methane emissions from livestock. There has been quite a bit of developmental work on these emissions measurement issues and the system is getting pretty close to the roll-out stage and there's a lot more work going on through the DAFF program Australia's Farming Future.

It was announced in the Government's CPRS White Paper that the Government will develop a 'sister' product to the National Carbon Accounting System based on the NCAT, which will be a national greenhouse accounting toolbox specifically tailored to the CPRS carbon market, and capable of operating at the project or farm level, that incorporates all the site and management practices. There is obviously a lot of discussion to go about how the information about farm management practices and so on can be strengthened in that system.

The Department of Climate Change developed a pilot version of the NCAT system in 2005. That version is pretty clunky in some respects, but there's over 10,000 users of that at the present time in all sorts of different regional enterprises including forestry companies. Because that system has an incomplete coverage of agriculture, there are obviously not many agricultural users at present. As you heard this morning, the toolbox capability on forestry has to be fully ready for operation from 1 July 2010, so the Department of Climate Change will be making a big effort to lift that toolbox capability over the next 12 months. The aim in that time will be to have a web-based product with simple, sophisticated screen interfaces that are hooked into these enormous land system databases that sit in the background and are the computer engine room that drives the national accounting system. It will be simple and low cost but it will be high tech and it will provide a reliable emission and sink assessment for the forest industry. For agriculture, the Department will be simultaneously designing the accounting and measurement capability for the sector, but until we know the rules we're going to have to have some fairly open ended architecture for that system.

In summary, there are problems in the Kyoto rules at present, and Australia's efforts in international negotiations are focusing on comprehensive accounting and developing rules that reflect the realities of the land system. Australia is well placed to develop a system that will provide emissions and sequestration information for the land sectors, but more building work needs to be done and I look forward to working with the agricultural industries on that task.

The Views of the Environment Sector Concerning Australia's CPRS and the Role of Agriculture

Paul Toni

WWF-Australia

Paul Toni has been the leader of WWF-Australia's Climate Change and Sustainable Development program since 2005. He is responsible for WWF-Australia's domestic climate change, renewable energy and carbon capture and storage campaigns and for the implementation in Australia of WWF's global programs to reduce tropical deforestation to avoid greenhouse gas emissions (REDD) and to reduce the environmental impact of timber, pulp and paper, oil palm, livestock and sugar production. Before joining WWF Paul was the Principal Solicitor of the NSW Environmental Defender's Office.

Thankyou very much for inviting WWF to come along and talk today.

About seven years ago or so I was the Principal Solicitor of the NSW Environmental Defenders Office and one of our clients, which was one of the larger environment groups in NSW, had been involved in the preparation of the Regulated River Water Management Plan under the NSW Water Management Act. This was an Act introduced to establish in NSW a market based or semi market based water management system.

One of the fundamental tasks of the Regulated River Committee, which my client was a member of, was to allocate a volume of water for fundamental ecosystem health that would be deducted from the total volume of water which was then allowed for consumptive uses. There was actually a high degree of agreement between my client particularly and some of the irrigator representatives and if there was an overlap, there was at least a fairly solid level of support for a certain volume being allocated. My client was quite surprised when the plan was made and a much lesser amount was allocated for ecosystem health. They sued and a number of irrigators in another area of the state sued, and the cases were joined together and went first to the Land and Environment Court and then to the Court of Appeal and after they both failed in the Court of Appeal they both appealed to the High Court of Australia. In the meantime the NSW Government passed an Act validating the plans and extinguishing both sets of legal proceedings.

You could understand in view of my last experience with market-based schemes why I approached the CPRS with a bit of trepidation. Water, in particular, is an area where we do have a market-based scheme, which has singularly failed to work from the perspective of the environment groups or the environment lobby. Admittedly, there has been a very long and very severe drought but of course, schemes that don't work in times of crisis are not really what you want. What is required is schemes that work 'around the clock' so to speak. This is not to say that the CPRS is flawed. WWF has supported the development of the CPRS and has been very supportive of the Government's adoption of a conditional 25 per cent emission reduction target by 2020. That said, the level of special pleading

from major emitters has been unsettling and a lot of it is simply special pleading. All of it has a serious consequence, which has already been identified and discussed in the media at some length. The consequence is that the money available to drive innovation, which is the critical issue in reducing emissions in the longer term and the medium term, has already been used.

Today I want to make a few points drawing on my own WWF experience of the CPRS and at the end of it I am going to suggest a few, and they are just suggestions, a few proposed key measures, proposals, or ideas to ameliorate the pain of the process.

Ultimately this is a pollution reduction measure. To date, we have dealt with the pollution by releasing it into atmosphere. To capture it and dispose of it will necessarily impose a cost. That means we're really discussing the scale of this cost, how to minimise the cost and how to make the process as painless as possible.

From WWF's perspective and I think from the Government's perspective the CPRS really has three elements. The first is to foster an effective international agreement. I think the Government's decision to adopt a 25 per cent emission reduction target conditional on other countries who are major emitters taking significant measures is a very welcome one. This is because it fosters a negotiating environment where one significant country, Australia, which is in the top 20 emitters in the world, has clearly stated what it thinks is necessary for an effective international agreement. Combined with the proposals put forward by Europe there is in fact now a body of ideas on the table. The Australian proposal is very similar to the European proposal; perhaps a bit more detailed in fact; and both provide the outline of an effective international agreement that is starting to, we hope, emerge.

The second very important element of CPRS is to assist in the transformation of one of the most carbon intense economies in the world into a lower carbon economy in a relatively short period of time. I think it's often not appreciated the scale of the transformation if the world is to avoid the worst impacts of climate change and really the task before us is so great that you would only do it if you could avoid the worst impacts of climate change. Both the EU and the USA have set emission reduction targets of between 80 and 90 per cent by 2050. Australia will probably go down that route. It probably has no choice but to do so. Those sort of emission cuts will have to be found domestically. It will not be possible to import permits by 2050 for a variety of reasons I'm not going to traverse now, but am happy to talk about if you wish me to.

Essentially by 2050 the power sector in every developed country will have to be carbon neutral. That necessarily means in a country like Australia or the United States, that the agricultural sector also has to dramatically reduce its emissions, cutting them by much more than half. Now this is over a period of 40 years or so, but that is within the planning horizon of many of the farms and farmers in the room.

Many of you will have children who are young or grandchildren who are young or indeed starting to grow up who you would like to take over the farm. So that planning horizon is not that distant really. I think it is also fair to say that we talk as if these changes will take place over 50 years and indeed they will, but many of the critical changes will take place over the next decade or so.

These international negotiations are as complex as any international negotiations on the face of the planet. To encourage many countries, nearly all of which in the world are poorer and in many cases significantly poorer than Australia, to constrain their growth in emissions and adopt new technologies will be a formidable task. That can only really be achieved if developing countries start making significant cuts very soon and stick to those cuts. There will no doubt be backsliding and we have to really plan our business and the way we develop the country on the basis that there will be backsliding. However, if the momentum is there in the major economies; and a sign of that is that Australia was recently invited to the meeting in Washington of the top 20 emitters; there is a very good prospect that we will be able to avoid a lot of the worst impacts of climate change.

An additional issue is that because we are introducing a cost on something we presently dump at no cost, it will be necessary for governments particularly and also for corporations to show that the additional money they are taking to develop low emission technology and processes is being used, if not in real time, then very close to real time. Otherwise, it's only a matter of time until people start to question the value of the whole process.

In short, while the CPRS or a similar price is essential, it is very difficult to see how it will be sufficient in itself and I don't think that is disputed by anyone. I think there are a number of issues that I'd like to draw out even if only briefly because I think they impact on the way forward and I would suggest that they impact on the way forward for the agriculture sector.

Firstly, the scale of the transformation is enormous and it will be very, very difficult. If it's driven by price alone it is very difficult to envisage how that would be politically sustainable. Europe has a relatively modest carbon price at present, which is, however, significantly higher than the one proposed in Australia initially, and that hasn't driven significant change to lower emission technologies at this point in time. The European Parliament and European governments have come under tremendous political pressure to abandon or at least greatly modify the scheme, which would necessarily impact upon its effectiveness.

This is also true in Australia where there has been a very strong reaction largely from major emitting firms which have driven the response of the major business associations. Rather disturbingly, there is relatively limited response from smaller firms and that might suggest that in fact there is another wave of political concern to come. Now this is a democracy and people can raise their concerns. However, I think that it is worth planning for a CPRS that accommodates the necessity of trying to keep the carbon price at a relatively modest level for some time.

A second issue that is particularly important in this sector, and we have heard this many times this morning, is food security. This, unlike electricity generation which is important, which is a big industrial process that takes place a long way off, food security is something that is a highly emotive issue that affects everyone. Presently the world produces more than sufficient food to feed everyone. The main issues in terms of food security are really timing and reserves but, of course, these are susceptible to natural events and the sector is affected by a whole range of other issues quite apart from drought and other phenomenon like trade barriers, perceived and real commodity price speculation, fuel prices so on and so forth.

This is an issue that will become more and more prominent over the coming decades as Australia and the world gets drier, populations increase and in many cases the overlap between those two is very badly matched so that there is a very high population growth in places that are and will have declining water supplies. This is particularly so if Africa doesn't find a way to start unlocking its agricultural potential.

A further issue that I would suggest the CPRS will not really address is structural changes to the economy of the nature that are involved in the transformation of not just one, but a number of different economic sectors at the same time. I will only touch upon this very briefly and note the agricultural sector already has severe shortages in particular skilled professions. Those shortages have arisen at a time when the agricultural sector is prosperous and it is obviously an essential part of the economy. Nevertheless these shortages have arisen. They arise in other parts of the economy too. Nursing would be another example. Unless these are addressed in a systematic way we might find ourselves with a desire to take action but an inability to do so.

Finally – well, finally but one – there is the normal cultural resistance to change and this is not limited to this sector by any means. You just have to read the front page of *The Australian* to see a variety of extremely large and wealthy firms that are fiercely resisting change. Nevertheless WWF has worked in many parts of the world with the farm sector. In Australia WWF has worked with the cotton sector, the sugar industry and the beef industry, and WWF has also worked a lot in South Western WA. In

all these cases, the approach that is favoured by WWF is the development and adoption of best management practice and schemes of that nature to address the issues under consideration.

WWF is frequently approached by the initiators, the innovators, the people in an industry who recognise a problem and who come through the door wanting something done. This happened very recently to our Queensland office with some sugarcane farmers. Quite a large group of sugar farmers came in, and they all wanted to do something about pollution on the Great Barrier Reef. It is always good to work with such groups, although I think all of us realise that this does not mean the entire industry is 'on board' with any initiative. There will always be early movers, then a large group in the middle, and then finally a smaller group of laggards who don't want to change at all.

Having said this I don't think farmers and the farm sector are any more resistant to change than any other significant group in society and one of the greatest impediments to change is not having a road map; not having an appreciation about where things are going. Again this was an issue that has been raised this morning a number of times.

Finally I think it is important for us to recognise that there are limitations to economic modelling efforts that are very real. There is not a single economic modeller in the room or in the world who would not agree with this. However, in the hurly burly of political life, modelling takes on a life of its own. In fact we know that any modelling that is done will be wrong because it is an idealised mathematical formula of the way firms, countries and humans act, and the interlinks between them. A rather graphic example of the dangers in economic modelling has really been seen with the global financial crisis, the impacts of which have been consistently underestimated by all the leading modelling institutions in the world, including the World Bank, the IMF, the OECD. Again in a period of crisis, you might say, 'Well, a crisis of that scale is unforeseeable' but once again the tools you need are the tools for the moments of crisis.

In concluding, there are a number of suggestions that I would make, and that I think WWF would very strongly support. The first of these is the desirability of having a vision and pathway for a near zero emission agricultural sector by 2050. It is understandable that you would all start with a desire to protect the beef industry which is obviously the industry most likely to be affected. It is quite possible that such an emission reduction can be achieved in that sector and it is very understandable that we would try to achieve it. The beef industry has available a vast amount of money and professional skills as well. It's important that these resources are utilised in this effort, and that the research is done to try and enable the beef industry to be maintained. Having said that, we do have to consider the real likelihood that it will not be possible to greatly reduce emissions from the beef sector without reducing production.

To take one example, for many years in Europe about 90 per cent of the energy research budget was spent on the development of a fusion reactor. Despite all this research, this technology has, as they say, not boiled a cup of coffee as yet. Research is important and desirable but may not be successful and it's important in a country where we do have other options that we start exploring them and drawing them out. This is also true of adaptation. This is not to propose a prescriptive approach but it is to propose a way forward that is available to participants in the sector if they choose to follow it. No doubt there will be people who don't want to. I think we also need to explore the issue of food security in a dispassionate way and recognise the limits of Australia's obligations there.

This is a long way of saying I think there is a lot of merit in the proposal of the Queensland Farmers Federation, that there be some sort of accelerated best management practice system. It would have to be accompanied by regulation now because we are dealing with a dangerous pollutant. Nevertheless that sort of on-farm on the ground approach, in a situation where we have great levels of uncertainty has many attractions.

To achieve progress in this area, I think we need to create a new position, termed Parliamentary Secretary for Sustainable Agriculture. The reason I am proposing the creation of a position termed the Parliamentary Secretary for Sustainable Agriculture

is there is presently lacking in this issue a target to which you, or anyone, can go to try and develop new ideas in sustainable agriculture. There are too many officials, too many offices, too many other departments scattered across the country. In adopting this approach I am taking a lead from the decision of President Obama who has appointed an Assistant Secretary for Energy Efficiency. The point of creating that position was that although this is an issue controlled by the states, it is recognised that in fact without a single person in charge to drive energy efficiency reforms through the Government they just get lost.

In closing I want to recognise that there is an enormous amount of good work that is being done in the country and I don't want to offend anyone by suggesting that there isn't. There are also many, many programs in the agriculture sector that have been outstanding in achieving change. However, one of the consistent issues I have seen is that really good programs have simply not been well communicated, and rarely get beyond that group of early adopters. They do have the potential to be really transformative, but they are not being taken out and communicated to the sort of large numbers of farmers that we need to make them really actually work.

Panel Session: Ian Curruthers & Paul Toni

Q. To Ian firstly if I could. Ian in your presentation you were talking about that NCAS tool for measuring carbon. Did I understand you correctly that you can use that down to an acre level on my property and tell me what my carbon emissions are?

Ian: The simple answer to that is yes, but not with a complete account of all the greenhouse emissions for each property. As I mentioned we don't have in there at the moment the nitrous oxide emissions. We don't have in there the methane emissions from the livestock. Let me give you a practical example, using the example of Queensland land clearing. A large part of the Australian emissions profile has been associated with land clearing. Big reductions have occurred in those emissions since 1990 associated with land clearing. Under the National Carbon Accounting System, we measure the loss of every clump of trees, meaning that every 25 square metre canopy of tree loss is measured, year on year. We know exactly where the trees were. When the trees are lost, we know when the trees regrew and we know their stage of regrowth. So this is basically the precision that you can get using modern science, coupled with modern information technology.

It's the same kind of GPS positioning technology that farmers are routinely using using for cropping now. The development of this technology has resulted in a transformation in our capacity to assemble knowledge. It did not happen by chance, it required the design of systems that were tailored for this purpose. However, in answer to your question it provides the capability to have farm level accounts, accessible via internet-based systems.

Q. Ian, when Article 3.4 dealing with emission and sequestration on agricultural lands was negotiated under the Kyoto Protocol, Australia's set a zero target because, as I understand it, it was believed that this would be impossible to measure. My question is whether you believe Australia's ability to measure this has improved since that time? Is Australia going to be able to incorporate emissions or sequestration in the national emission inventory after 2012, or are we still in the same position?

Ian: Article 3.4 dealt with emissions or sequestration arising from broad land management activities, so you are right in what you said. When the Australian Government did the risk assessment on the Article 3.4 activities one of the issues was an inability to measure changes due to land management decisions, and in particular to separate those from changes due to natural seasonal variation. Since that time some progress has been made to the extent that we are now confident that we do have the know how to manage this issue. There is obviously more work to be done and we can improve, however, that won't take very long to achieve.

Q. A question here for Ian. There's the International Organisation for Standards currently working on an ISO standard for carbon footprinting. Although these standards obviously aren't

regulatory documents, they do become a convenient solution for retailers or market gatekeepers to pick up and apply to product. Is there any opportunity, will or interest in seeing that post-Kyoto type emissions accounting framework align with the ISO or vice versa? Otherwise, is there the prospect of products or producers reporting against one market focus standard and one regulatory focused standard, which are different standards?

Ian: It doesn't help to have different international bodies promulgating different accounting standards, and different accounting approaches. That is the reason we have treaty obligations under the UN Climate Change Convention and the Kyoto Protocol, and as part of that agree to be bound by the Kyoto Protocol greenhouse accounting rules. It would be nice to have agreement between whatever ISO is doing and the greenhouse accounting rules that have been established by the UN.

Q. A question for Paul. Paul you talked about the importance of long-term targets and a pathway for getting there which I think is a good way of overcoming cultural impediments you were referring to. In framing that, how important are the interim milestones? We're all quite comfortable with the idea that things have to happen a long way down the track but I think that in another part of your presentation you hinted at the need for action sooner rather than later.

Paul: Yes. Well the Government has set interim targets. They clearly are essential just to preserve the credibility of the process, and mid-term targets, 2020 targets and subsequent targets are critical. If nothing else, they provide credibility with the process and they don't lead to the postponement of action until the point when it becomes impossible. It creates a series of bite size steps rather than a daunting, major one.

Q. Australia is very lucky. We've got a free-range animal industry and we have very good processing and industry standards. If we have a tax or a financial cost on Australian farms ahead of the rest of the world and that's likely to lead to carbon leakage and make the problem worse, does WWF support carbon permits for trade exposed industries?

Paul: We have. I can say that with complete confidence that we think that the number that has been handed out is far in excess of the number that should have been, but we understand the problem of carbon leakage and it's clearly in everyone's interests to prevent that. The consumption tax that I was going to propose at the end of my talk, but didn't get to due to my poor time management, would actually fall on consumers rather than producers, and would mean that an equivalent cost would be applied to both domestically-produced and imported products. This is a much neater solution that the free-permit proposal detailed in the CPRS white paper.

Q. Ian, I appreciate the description that you gave about the accounting difficulties that we face internationally. Given that Australia joined the Kyoto Protocol just recently and other countries have been involved for a lot longer time, are there any examples that you can give where it's actually working or is it just a whole can of worms that we have to deal with?

Ian: Well, in terms of accounting and measurement of emissions, nationally I think Australia is up there with the best of them. The reason for that is that Australia got special treatment in the Kyoto Protocol which meant the nation was able to count reductions of emissions from land clearing, and the Government knew that was going to put Australia right under the spotlight, because that was a very contentious issue in the negotiations. We've seen a big reduction

in deforestation emissions in Australia, and in some respects have paved the way in showing how this can be done in tropical forests, which are the world's second largest global source of emissions. However, it was evident Australia would come under scrutiny from the UN international auditors who have the role of checking national inventories, which they have done. Australia needed a smart, cost effective and scientifically robust approach. While this involved greater upfront costs, I think it is a comparative advantage as we think about options for the carbon pollution reduction scheme in the land sectors.

Q. There's a couple of suggestions which have been made about BMP's or standards being introduced. I wonder if, Ian, you could tell us just very quickly, how would you get a standard in place that had a domestic applicability through the IPCC? What's the process by which we might get a BMP into our accounting system? What's that mechanism?

Ian: For a Best Management Practice (BMP) approach to work there is a need to have measurement and accounting systems associated with it. However, that would be a nationally specific solution and so there will be a need to design measurement and accounting systems around that. In any event, the national greenhouse accounts will still need to be calculated according to the international rules. This means there is a need to align the BMP with the international rules that will be set through the international forums. If you want to link a BMP approach to some kind of carbon offsets arrangement then you've potentially got some problems in terms of how tradable the permits are within the CPRS and between Australia and other countries, so you need to sit down and think about just exactly what you're trying to do with a BMP. Is it a transition process? Is it meant to be a long-term solution?

Q. My question probably flows neatly from that Ian. It seems and I guess Paul might have a response as well, it seems that ultimately it boils down to actions and mitigation in the agricultural sector, to be acceptable, will require the comprehensive set of international rules with the changes you've suggested before they will become part of the Australian system one way or another. So if you were a betting person which you may well be, what's your guess as to the likelihood of a comprehensive system of land accounts that we can work with post 2012 at the moment?

Ian: When I read the business pages in the newspapers and I see that there is discussion around flaws in international financial accounting, you ask yourself, what is it that drives change in international financial accounting practice? It's usually some kind of disaster like the Global Financial Crisis. People wake up and say, 'We didn't have it right we've got to change it.' I think that probably the issue is at the point where people say international accounting is fundamental to an effective response on global climate change. There is a need to have that right and I think the message is getting through that the system is not right especially when accounting for land systems. If the world wants to have emissions from land systems as part of an effective part of national responses, then there is a need to come up with an accounting approach that is far more sensible.

Sequestration Options: The Future Role of Carbon Sink Forests Under the CPRS

Richard Stanton

A3P

Richard's background is in forestry, wood products and paper industry policy. Richard has been with A3P since its formation in 2004 and was appointed CEO in 2008. Prior to joining A3P Richard gained substantial industry association experience with the Australian Paper Industry Council, the Plantation Timber Association of Australia and the National Association of Forest Industries. He has also worked in a number of policy development roles with the Commonwealth and NSW Governments. Richard holds a Bachelor of Science (Forestry) Honours degree from the Australian National University and a Master of Business Administration from the University of Technology Sydney.

Thank you for the opportunity to address this conference today. By way of background, I would like to first provide you with some information about the industry that I represent.

We think of it as being made up of three core parts, but the three core parts are integrally related to each other and something that affects one part, affects the other; so it's very important to understand the interrelationships in our industry.

First of all, our organisation represents tree growers, who are the owners and managers of about two million hectares of softwood and hardwood commercial timber plantations in Australia. These plantations are owned by state governments, by superannuation funds, by industrial growers and by managed investment schemes, and they have been established with significant capital input with the aim of producing a finished product.

The tree growers supply the primary material to our second core group of members, who are the wood product manufacturers. These include saw millers, panel board manufacturers and plywood manufacturers. And these principally supply the domestic housing market, so their fate is very much determined by what is happening in house construction in Australia, a fairly topical issue at the moment.

The third core group of members are the pulp and paper manufacturers. They manufacture printing and writing paper, newsprint, packaging and tissue or sanitary products. They are primarily focussed on supplying the domestic market but they do export some product and they certainly compete with a lot of imported product. They are also heavily involved in recycling.

That's broadly the industry we represent. It's a quite a big value chain from primary production through relatively high level manufacturing right through to the marketing of consumer goods like nappies or tissues. It is a fairly significant sector in economic terms, and the diversity of businesses makes it very interesting when we come to deal with climate change issues, and the CPRS specifically. I won't go into all the ins and outs for each of the sectors that we deal with, but as you can imagine the CPRS is initially of interest to forest growers, given the role of growing trees in capturing carbon from the atmosphere.

As I noted earlier, forest growers are linked to the rest of the industry and so it is important to understand how climate change policy might affect some of the other industry players. Sawn timber manufacturing members of our organisation sell some 3 million tonnes of sawn timber every year. To be honest with you in a lot of respects they're

on the margins of climate change policy. They're going to experience a lot of the input cost increases that have been talked about today that will be experienced across the whole economy. However, from their perspective they believe that if the system works properly, their competitiveness will improve against their main competitors like steel, concrete, aluminium and plastic. The reason is that all those alternative products should become more expensive because of the costs of the energy inputs used in their production. In the medium to long term, if the system works we should see an advantage for our timber processing industry in Australia.

A group of our members with a somewhat different perspective are those involved in the pulp and paper manufacturing sector. These businesses are completely exposed to international competition, and use lots of energy in their businesses. They generally meet the criteria to be considered as Emissions Intensive Trade Exposed (EITE) activities, and we have already heard some discussion around that topic today. If as a result of the emissions trading scheme their costs go up and their international competitors costs don't go up, we're going to see carbon leakage, and in terms of the Australian market we'll just see less paper produced here and more of it imported from overseas, especially from countries which don't have any emissions trading scheme.

As you can see from this introduction, our organisation represents businesses that have a variety of different perspectives on the CPRS and how it may impact on their businesses.

I am principally going to talk about reforestation or afforestation here today and not go into the EITE issues, although I am certainly happy to discuss those as well. From a Kyoto Protocol emissions accounting perspective, I am really talking now about the Land Use, Land-Use Change and Forestry (LULUCF) category which is made up of the emissions from deforestation and the sequestration from reforestation; and it is perhaps no surprise that what our organisation's members would like to see is that carbon sequestration through growth of forestry will increase and reduce Australia's net greenhouse emissions.

The first point that requires consideration concerns deforestation of pre-1990 forests. Emissions from this source are not really covered in the proposed Scheme (CPRS). The Government seems to have made the assumption that it is going to control the reduction of that forest area through regulation, and I guess to the extent that it occurs that will be outside this scheme and in effect the Government will manage that as part of their wider policy considerations. Native forest management has also been an issue of contention, especially the whole debate about how our native forests and pre-1990 plantations are managed. These forests are grazed, they are harvested, they are burnt. A range of different management regimes is applied to these, but as has been pointed out it's probably safe to assume that in some way that over an extended period of time, provided you maintain the forest area, the amount of carbon stored in these forests is probably reasonably constant.

What the Government intends to include in the CPRS through the decision it has outlined in the White Paper and now in the draft legislation; is that reforestation – the establishment of new plantations on land which was cleared in 1990 – will be allowed to opt into the scheme but only with respect to new carbon which is sequestered or absorbed after July 2010. This is an issue I will talk about in a little bit more detail.

Just before I go into that though, there are some fundamental issues that need to be understood that underpin the Government's decision to include forestry.

Firstly, as was already mentioned this morning, the Government would like the CPRS to cover as many of the different sectors as possible, and to have as broad a coverage as possible of all emission sources and sinks. The theory is that that will minimise the cost of the scheme because it will maximise the different options that are available for reducing emissions and the price pressure will find the cheapest cost approach.

There has also been discussion today about Australia being a leader in accounting for carbon in the landscape, meaning the nation has the systems in place to manage forestry emissions. The

intention of the New Zealand Government is also to include reforestation in the New Zealand ETS, and in fact, it was the only thing that was intended to be included in the scheme when it was first legislated in New Zealand. Maintaining consistency between Australia and New Zealand is considered quite an important issue for the Australian Government. I'd say it's also a quite important factor for our industry because we have a lot of linkages in the forest industry between Australia and New Zealand.

Finally, a reason why the Government might look to include reforestation is the view that forestry can provide a 'bridging' greenhouse emission abatement option, in the interim while alternative technologies are developed.

On the other hand, there has been pressure from some interests to exclude reforestation from the CPRS, and I am sure these will all re-appear as the legislation is debated in the Parliament this year and whenever it is discussed in the future. There are also issues about the international consistency of including forestry. The European trading scheme certainly doesn't include reforestation. Reforestation in some people's mind is relatively complex so would be a lot simpler just to ignore it. There are some people who think it's the wrong type of abatement, because they want abatement to involve lots of pain for dirty industries and planting trees doesn't sound like pain, so they think it's the wrong type of abatement. There are also questions about accounting difficulties. How do you measure it, how do you audit it? And finally there's the question of permanence. What happens if someone cuts it all down or if it all burns down? What does Australia do then if we have relied on that forestry sequestration as a significant source of greenhouse gas abatement?

A further point I'd like to clarify before I start discussing how I think this is likely to play out, is the potential of different types of reforestation. I think these often get confused, and to be honest there are probably a spectrum of different types of reforestation, but I've identified three different core types. It is really important to be clear which one is being considered before jumping to conclusions about whether it's a good thing, a bad thing, whether it's likely to happen or how it's likely to work.

Firstly, there are integrated environmental plantings. They might be landcare plantings, or windbreaks, or areas on a farm which are set aside because they are not productive, or for biodiversity or other reasons. Whatever the reason for the trees, any area planted to trees will have some carbon stored there. The key points I'd like to identify about environmental plantings is that normal production on the overall farm will continue. A small proportion of perhaps 10 per cent or 20 per cent of the farm area might be dedicated to carbon storage. There are some significant difficulties associated with measuring and auditing them on a continuing basis and I think a lot of those difficulties flow through into other sorts of potential sequestration such as soil carbon.

The second category of reforestation is broadscale environmental plantings. This involves large areas of land. Some might refer to this as marginal land although I think that's really a matter of the eye of the beholder. It involves converting large areas of land to forest or vegetation, and essentially taking it out of agricultural production. Gradually over time the amount of carbon stored in that planting will increase up to a point and then it will remain relatively stable. The important point about such plantings is that you might earn income from it by selling carbon credits over a certain number of years, but beyond that time you will earn no further income from that land. The land would then be permanently out of agricultural production, but there would be management costs associated with the land in the future.

The third sort of reforestation is commercial production forestry plantations, and this is the sort of plantations that the membership of our organisation is interested in. This is where a forestry investor or manager establishes an area of land to trees. As those trees grow they store carbon, but the owners always have the intention of harvesting the trees and using the timber in wood products. Generally, it would be anticipated that after harvest, the area would again be replanted to trees, and so in that sense the plantation represents a permanent store of carbon in a permanent forest which is managed for wood production and increasing the storage of carbon in harvested wood products.

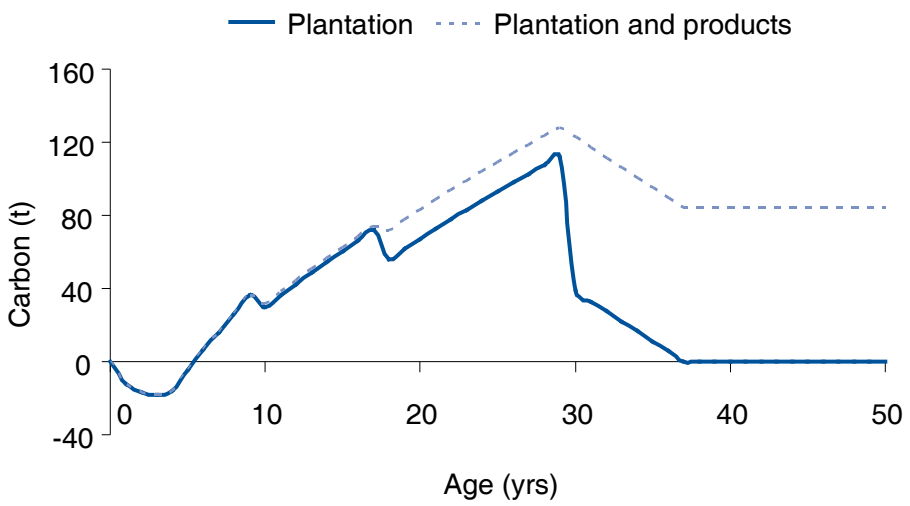


Figure 1: Plantation carbon profile over time.

The graph that follows is a forester's graph, except that forester's graphs usually have wood volume (sawlogs or pulp logs), along the vertical axis whereas this has carbon.

The graph shows the change in carbon sequestration throughout the life of a timber plantation. Initially, there are some greenhouse emissions created during the planting phase, due to soil disturbance and the use of fertiliser. Then, gradually over time, the plantation begins storing carbon as the trees increase in size. In theory, as a consequence of this growth the forest owner should be able to go to the relevant authorities and say, 'I've established this plantation, this is the carbon that's stored in it'. As a result, the owner should receive some emission credits which can be banked or sold. At various points in the life of the plantation, depending on production plans, the owner might harvest some trees. At that time, the amount of carbon stored in the plantation will decline. This increase or decrease in stored carbon may continue until the plantation reaches the end of its life, at which time the trees will be harvested. At that time, a lot of the carbon stored in the trees will be converted into wood products. Some of it also remains on the site, in the form of stumps, branches, etcetera and will decay relatively quickly within a few years.

The above depiction is for one individual stand of trees of a given age. Ideally, forestry plantations will be managed in a way that means the plantation creates a net increase in the stock of carbon at all times, despite harvest and other management activities.

That's broadly what we're talking about when we're talking about storing carbon in forests. Given that, and given that the primary aim of most of plantation owners is to grow these forests to produce wood, why would they want to get into the carbon business?

There are some pretty fundamental issues involved, and I'll just run through them briefly. If you think about growing a forest as a single investment cycle, it costs a certain amount of money to plant the trees, then to grow them and harvest them, and at the end the investor finally earns some income. From a carbon sequestration perspective, the process is essentially a zero sum game. If sequestration income is earned during the life of the plantation, then it will need to be repaid when the trees are harvested. Alternatively, if you do replant and undertake forestry rotations, you've essentially had a one off gain and that permanent potential liability remains sitting there at some point in the future. However, even under that circumstance where you've created that potential liability it

may still be in your interest to become involved in emissions trading for a number of reasons. Firstly, selling sequestration credits potentially provides some early revenue. Normally, the most difficult thing about investing in forestry is that there is no revenue until the end of the life of the plantation, which might be thirty or forty years into the future. If you can get some credit for carbon that's stored within the first few years that can certainly help the economics of growing trees.

Secondly, you might or might not, be interested in speculating on the future price of carbon. If you think there's going to be some great new technology in the future that's going to solve the greenhouse emission problem, then you expect the future price of carbon will drop. To take advantage of that you want to create as many credits as you can now and in the future your liability will be much smaller. That is an option, although I'd have to say not many forest growers are really interested in speculating on the future price of carbon given the Government influence in determining that price.

A key area that forest growers have identified as a major issue in making carbon sequestration attractive from a forestry perspective is getting credit for the carbon which is permanently stored in harvested wood products. That has not been achieved as yet. There has been some acknowledgment by the Australian Government that they will take that proposal into international negotiations but there is currently no credit for harvested wood products in the proposed CPRS.

Given the above, what is likely to be the impact of the CPRS on the scale of forest plantations in Australia? There are obviously some who are concerned that the CPRS will simply result in a very large expansion of plantation areas. To answer this question, I think it is useful to look at the history of plantation development in Australia, which is displayed in Figure 2.

Back in the 1950s there wasn't a significant area of plantations in Australia. The area of softwood was increasing steadily during the 1960s, and then in the mid-1960s the governments made a major commitment to expanding the softwood plantation estate. This trend has continued, and in addition in the late 1990s there was an increased focus on the development of hardwood plantations as supplies of timber from native forests became more restricted. At present, there are roughly two million hectares of plantations.

What might happen in the future? Well ABARE has recently done some modelling on behalf of Treasury as part of the overall Treasury modelling of the impact of the CPRS and they came up with some pretty amazing projections. I won't go through explaining what all the different scenarios are but suffice it to say they are based on different targets and different projections for carbon price.

You can see below (Table 1) they assume that if there was no carbon price we would see continued steady increase in the plantation area, which is projected to increase by 610,000 hectares by 2050. That rate of expansion would actually be slower than what has been experienced in the past as these projections extend over forty years into the future. In contrast to this, under all the various CPRS scenarios the result is a projected major expansion of plantings; either timber plantations or in several of the scenarios, a major expansion of environmental plantings. The projected areas of plantations are enormous, especially against a background of two million hectares of timber plantations at present. For even the most modest CPRS scenario, the projection is that there will be another one and a half times the current plantation area and a much bigger area of environmental plantings by 2050.

I've been fairly critical of the ABARE modelling, although to be accurate, I'm not really critical of the modelling but I am critical of the assumptions that underlie the modelling. Why am I critical of the ABARE modelling? Well I've written a brief paper about it and could go into great detail, but these are the core reasons. First of all there is an assumption, in the modelling, that if you go out and grow trees you'll be able to get credit for 100 per cent of the carbon that's there in those trees. I won't go into all the details of how the crediting is likely to work but if you get the average amount of carbon that's stored in that forest over a given period of time, discounted by a significant amount to allow for various risks you'll be doing well. So

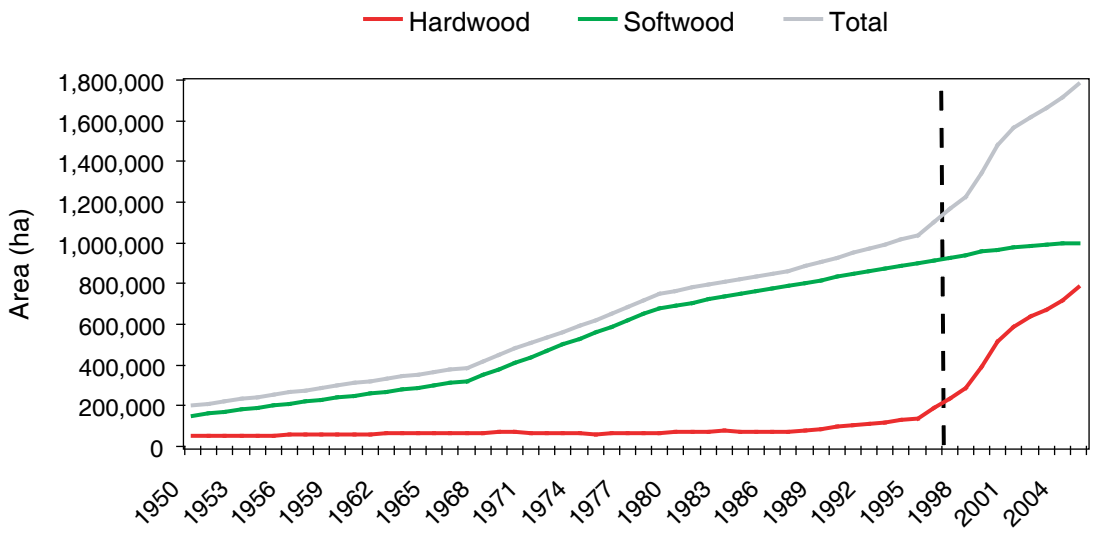


Figure 2: Plantation Expansion in Australia since 1950.

	Ref Case	CPRS – 5	CPRS – 15	Garnaut 10	Garnaut 25
Timber Plantations	610	3,047	4,514	3,562	5,028
Environmental Plantings	0	2,740	21,812	4,362	34,033
Total	610	5,787	26,326	7,924	39,061

Source: ABARE/Treasury Modelling – reforestation '000 ha by 2050

Table 1: ABARE/Treasury Modelling – reforestation '000 ha by 2050.

the assumption that you will obtain recognition for 100 per cent of the carbon stored in a plantation is very brave.

Secondly, the modelling makes the assumption that the minute that it becomes one dollar more profitable to change the land use from grazing to growing trees, that that will automatically happen. This doesn't take into account any of the realities associated with the nature of the land units, access to markets, the interests of the landowner, and a whole range of factors that would determine whether a landowner would choose to switch from current land use to growing trees. ABARE also haven't imposed any constraints on the level of demand for timber from these plantations, and in effect have said that the market would be infinitely large. The reality at present is that Australia's current plantation estate supplies the majority of our domestic needs, so to assume a market expansion of the scale these numbers suggest seems overly optimistic. Finally, the modelling has assumed that there is no ongoing management costs associated with environmental plantings. This is clearly not the case, and the imposition of management costs would reduce the projected area of environmental plantings to a significant degree.

As we were told this morning, despite the delay in the introduction of the CPRS, tree growers will be allowed to opt into the scheme from 1 July 2010 so they will be able to create credits for carbon stored in qualifying plantations after that time. They can bank those credits and sell them at a later date if they choose to. The bottom line as a result of all of these factors is that most of our

members who have an active interest in this area see the overall CPRS forestry package as onerous and somewhat ambiguous. While they are happy that the Government has included reforestation in the CPRS, the general consensus is that because of the detail and the hoops you have to go through and the costs associated with that, there will only be very limited commercial timber plantation expansion to provide carbon credits in response to the implementation of the CPRS.

It is worth remembering that the CPRS isn't the only game in town. There are a number of other ways that reforestation may benefit from climate policy. For example, there is a possibility that a significant voluntary carbon market will develop for those organisations that are not required to participate in the CPRS but which see value in being able to claim carbon-neutrality. There may also be other policy measures which encourage tree planting but that don't involve participation in the CPRS. The production of biomass as a feedstock for renewable energy production is one such opportunity.

The key issue for wood production enterprises is that there is likely to be increased production, use and recycling of wood products because they store carbon and are less emissions intensive than a lot of alternative materials. So my conclusion is the CPRS is certainly not going to stimulate a great boom for the forest and wood products industry but climate change and climate change policy are certainly seen as an opportunity for the industry.

Thank you.

Agricultural Sequestration and Mitigations: What are the Realistic Options for Ruminant Livestock?

Roger Hegarty

Industry and Investment NSW

Roger Hegarty is a livestock nutritionist and Principal Research Scientist based at NSW DPI's Beef Industry Centre in Armidale. He works closely with the University of New England in areas of methane measurement and methane mitigation, with particular emphasis on rumen manipulation and animal breeding to reduce enteric methane emissions. Current project areas include management of rumen protozoa and dietary nitrate to reduce emissions as well as genetic improvement for net feed efficiency and methane per unit intake.

Thankyou Mr Chairman, Ladies and Gentlemen.

This morning we've heard a number of presenters talk about policy measures that can be used to bring about reductions in greenhouse gas emissions. Fundamentally, they rely on the fact that there are actually ways that emissions can be reduced, which is a particular challenge for agriculture and the subject of much of my research. This afternoon I'd just like to step through three aspects of this issue in particular. First, I will provide just the very briefest bit of context about where livestock fit in the national emissions profile. Second, I want to talk about a systems approach to changing livestock emissions. Finally, I want to discuss what I'm supposed to be here for, which is methane-specific technologies relevant to the livestock sector.

By way of a very brief introduction, Australian agriculture produces about 16 per cent of total national anthropogenic emissions. Of those agricultural emissions, something like three-quarters of them are methane, and another 23 per cent are nitrous oxide. Of the methane, about 85 per cent comes from enteric fermentation, which is the term used to describe the digestive processes that occur in the rumen or foregut of sheep and cattle. Methane is also produced when pastures and stubbles are burnt, and there is also an absolutely miniscule amount from rice production, but these are things that I won't touch on even though I recognise there are other sources of agricultural emissions.

In summary, this means that about two-thirds of Australia's agricultural emissions are coming from enteric fermentation. The beef industry is responsible for about 60 per cent of those emissions, and the sheep industry 30 per cent, as can be seen from the following graph (Figure 1).

It's the time of the afternoon when people get contemplative, so the first point for contemplation arising from the graph is that there's a very small bar in the middle labelled feedlot cattle. One of the great white hopes is that scientists are going to come up with something that can be put into cattle feed to stop methane production. If that was possible and it was 100 per cent successful, the primary candidate for that technology would be the feedlot industry. The problem is, that even if the technology was 100 per cent successful in reducing emissions, the result would be a reduction of 2.5

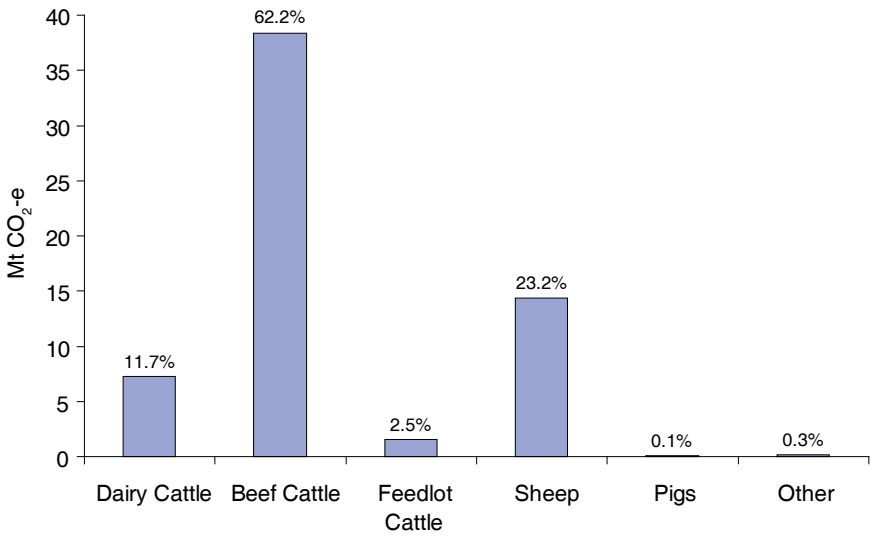


Figure 1: Sources of Australian livestock emissions: Over 95 per cent of animal emissions are from grazing livestock.

per cent in total livestock methane emissions. This suggests that a simple feed additive isn't going to deliver the sort of impact on national emissions that the Government would like to see.

It does, however, raise the important question of what mitigation success might look like for agriculture. I believe that the 'goalposts' in relation to this issue have not been appropriately defined. For example, is the objective reduced emissions per head, or that the national greenhouse inventory shows a reduced level of emissions for agriculture? Is it important that we reduce emissions per unit of product, per kilo of beef or per dollar of profit? Should I be able to trade off my trees against my burping cows? I think it's important for reasons that I'll demonstrate but fundamentally, I think the answer is going to be hidden in the fine print of the emissions trading system or other carbon regulation mechanisms.

To show you why I think we need to continue that discussion and exploration of what the goalposts are, let's just look at one of the 'can do' technologies. I was pleased to hear someone else use that term earlier today. As an example, we can examine some data from a beef production enterprise, one of the big pastoral companies in the Northern Territory, which used to run British breed cattle back in 1980. Using their historical data and appropriate emission factors, it is estimated that the business was producing about 1.1 tonnes of methane per tonne of beef that was weaned off the property. That was largely because their cows had very low conception rates. Since that time they've changed their cattle breed, they've changed some other aspects of management and now they've reduced that emissions per unit beef by about 25 per cent.

Similar results have been achieved in southern production systems. In that case, not through improving reproductive efficiency because that was relatively high, but through simple things like pasture improvement. As an example, if the starting point was an unimproved property utilising predominantly native annual pastures, for a sheep enterprise the emission result is likely to be about 380 grams of methane for every dollar of gross margin. Under a scenario where improved pastures are introduced, the result could be a 30 per cent reduction in methane production per unit of profit.

There are a number of lessons arising from this. Based on the numbers, a farm business manager who introduces improved pastures can possibly make enough money to be able to pay off any carbon penalty that might be introduced in the foreseeable future.

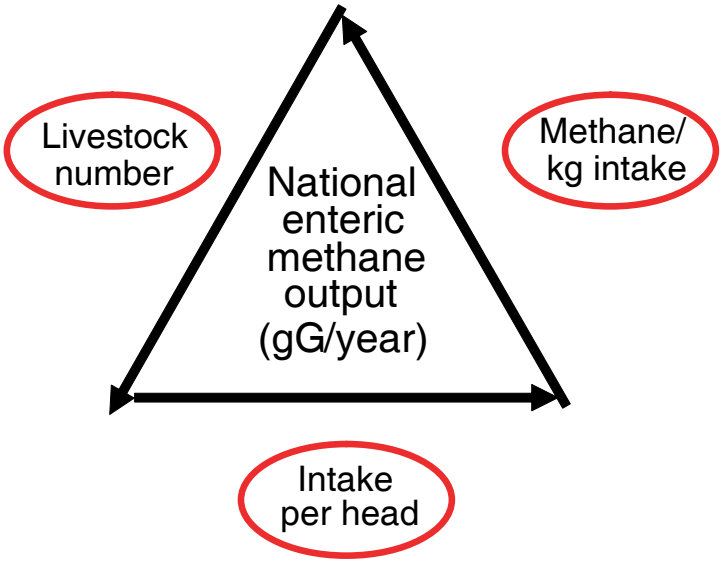


Figure 2: Options to reduce livestock emissions.

That is great from a farmer's perspective, but from a political perspective the comment might be, 'Those beef producers in the Northern Territory made their beef production more efficient, but because of that they can actually run more cattle on the same area of land.' The sheep enterprise is also more efficient, but the owner still has the same area of land, so not surprisingly sheep numbers are likely to increase. The net result in both cases is that total emissions will increase.

To take that sheep example a little further, if the owner was to improve the whole property it would obviously enable an increase the number of animals utilising the pasture effectively and more than double farm emissions. That is obviously bad news. But realistically, farm profit has gone up by about $90 per tonne of CO_2 that is produced. The result is there is a lot more greenhouse gas going out, but also a lot more profit for every unit of greenhouse gas that is going out. That highlights two things. Firstly, the farm business with the improved pasture is in a better position to pay an emission cost because the enterprise is more productive. Secondly, the farm business that doesn't invest in the more intensive high performance system is only producing about $40 of profit per tonne of emissions, so doesn't have as much capacity to pay a cost for the farm greenhouse emissions.

While I think these observations are important, developing and refining farm management systems is really the responsibility of farm business managers, not scientists. Our job as scientists is to provide the technologies and tools that farmers can use in their management systems. What farmers want scientists to do is to find ways to reduce methane emissions from sheep and cattle. What I would like to do now is to step through where the science is up to in providing ways to reduce livestock emissions.

The basic facts are that total livestock emissions in the national greenhouse inventory are a product of the number of animals, how much each animal eats and how much methane is produced for every kilo of feed that is consumed. That obviously provides three potential avenues of attack to reduce livestock emissions, as is depicted in the above diagram.

Let me start with livestock number. Livestock numbers change from year to year based on economic and seasonal conditions. A brief examination of the history of livestock numbers in response to events such as the dismantling of the wool Reserve Price Scheme in 1991 or the beef crash of the 1970s highlights how responsive livestock numbers are to economic shocks such as these. This leads to the conclusion that broadacre

livestock numbers are not something that can sensibly be managed or regulated by government.

It is a slightly different situation in the intensive livestock industries such as pork and poultry. In these industries, there is a much stronger regulatory regime, and farmers are frequently required to register something or to get permission for specific activities. To develop a 5,000 head feedlot or to put up a new chook shed for 2,000 layers both require permits of some sort. In these industries, there is already some capacity for regulation. However, in the broadacre livestock industry, how would the Government ever know if a farmer is running an additional 100 animals?

I guess one of the primary things about even thinking about regulation of livestock numbers is that so much of the ruminant livestock industry is based in the pastoral zone and particularly in northern Australia where there aren't alternative land uses available to replace livestock production. While I have no economic credentials at all, even an economic illiterate can understand that there is a need to be careful and be considering what alternative land use might be available in areas where carbon management might bring pressure to reduce livestock numbers.

The second route for reducing emissions is the amount of feed each animal eats. You don't have to be Einstein to work out there's a few possibilities here. Smaller animals generally eat less than large animals, but that goes totally against all the industry efforts over past decades to produce bigger, faster growing animals, so the concept of producing smaller animals does not seem likely to be attractive to the industry. However, one of the things that is possible is to actually breed cattle for improved feed efficiency. Research shows that feed conversion efficiency is moderately heritable, and our research has shown that when cattle are selected for feed efficiency, they grow at the same rate as 'normal' cattle but eat a whole lot less feed and consequently produces a lot less methane per day. The difference in feed intake rates was approximately 30 per cent, so the emissions intensity – the emissions per unit of product – will be much lower for the high feed efficiency cattle. So that's something we can do, albeit I have to confess after a huge amount of research, it's still struggling for industry adoption.

The real science effort at present is going into the third route for reducing emissions, which is finding ways to reduce methane output per unit of feed consumed. There are three broad approaches that are being investigated at present.

The first approach involves targeting rumen microbes. There are three options that some of you may already be aware of. The CSIRO was working on a vaccine to target the methane producing organisms in the gut. This involves vaccinating animals and using the animals immune system to just kill of the methane producers. That approach didn't go particularly well in field trials that were conducted some years ago, but New Zealand scientists have recently picked that technology up and are doing more work on it. Don't ask me who now holds the patents or IP or anything like that but suffice to say the New Zealanders are really pushing that technology for all they can; and I trust Australians will also share the benefits of that in some way.

You're probably also aware of some Queensland research, looking at the digestive processes of kangaroos and wallabies. These animals eat plant material, but their digestive systems in most cases do not contain methane producing microorganisms. The question scientists are asking is whether it is possible to transfer non-methane producing microbes into the rumen of sheep and cattle and change the way the rumen works. There is quite a strong research effort in both Australia and New Zealand looking at organisms that take the hydrogen that the methane-producers normally use, and convert it into acetic acid, and in that way prevent the development of populations of methane producing micro-organisms.

The third real microbial approach that scientists are taking – all of these being funded either in Australia or New Zealand at the moment – involves trying to wipe out protozoa in the rumen. Protozoa are microbes that support methane production in the rumen; they're also predators of the bacteria and in many studies, it has been shown that when you kill them off, methane production is reduced, protein

availability increases and animal performance improves if that performance is restricted by low protein availability.

A second broad area of research involves looking at ways to change the way the rumen works. As background information, on a high grain diet cattle only lose a relatively modest proportion of feed energy as methane, however on a dry spear-grass diet, cattle lose a much higher proportion of feed energy as methane. This highlights that changing feed quality will affect methane emissions. However, there is not a simple take home message on this, because changes in feed quality result in changes in feed intake rates and digestion rates, and some of these changes can be confounding. It is not possible, for example, to simply say that better feed equals less methane. That statement is incorrect unless it is accompanied by a good deal of bureaucratic qualification about how to interpret it. So there's no simple take-home message on this subject.

There are a range of other options that are being carefully examined. One approach, for example, involves adding extra fats to cattle diets. An example is beef feed lots that tend to respond to high grain prices by increasing the amount of oil in the feed they give to their cattle. It is known that putting fats in diets reduces methane emissions and there's a whole host of other possible feed additives that have a similar effect, including a range of antibiotics. A lot of work has been done on probiotics, not just the acetate producing probiotic organisms but others. Plant tannins and other natural plant compounds are also being looked at, as well as clays, soaps, and all sorts of natural acids and salts. There is a whole suite of these things that are being looked at that might reduce emissions, but it should be remembered that these are, in practice, restricted to that section of the livestock industry where stock are handled and fed every day.

A final approach that has recently gained some interest is attempts to breed cattle that produce less methane per unit of feed intake. Work on this has just begun, and it would certainly be of interest to be able to identify animals that differ in that characteristic. Scientists know that some cattle produce more methane per unit of feed intake than others, but work on whether that trait is heritable is yet to be done.

In concluding, let me just summarise these three areas of research. Firstly, is reducing livestock numbers a feasible way to put a big dent in methane emissions? I suspect the answer is no without putting an even bigger dent in the rural community and the rural economy. Second, is there a way to change the amount of feed eaten per animal and in that way to put a big dent in our national livestock emissions? The answer is yes, there are lots of ways we can manage the number of animals and the intensity with which they're managed and actually end up producing more profit and less methane. However, at the moment there are no market signals to encourage farmers to take such action.

If a farmer makes the farm business more efficient, then it will provide an opportunity to produce more animals and more methane. There is a need for some incentive or disincentives to encourage farmers to stop at the production goal they want and spare the rest of their land area and use it for non-grazing activities.

Is there anything science can offer at the moment that would change the methane output per unit of feed? Unfortunately, the answer is that it will be at least 5 years before there are any options available that can deliver any substantial reduction to the national livestock emissions total.

Finally, I believe there are technical means at the farming system level to reduce emissions per unit of product in all our livestock systems, and I think it would be possible to structure incentives to encourage the adoption of these practices. There are also good prospects for reducing emissions in the intensively fed livestock industries such as dairy and beef feedlots, and I believe we could easily to do that within 10 years. However, for the extensive livestock industries where most of the animals are, I've got to be honest and say I think that we are at least we're 10 years away from having technical solutions delivering substantial reductions in those emissions.

Thank you very much.

Agricultural Sequestration and Mitigation Options: What are the Realistic Options for Soil Sequestration?

Evelyn Krull

CSIRO Land and Water

Dr Evelyn Krull is a senior research scientist and Group Leader of the Carbon and Nutrient Cycling Group in CSIRO Land and Water. Her expertise lies in the application of stable and radiogenic isotopic analyses to determine organic matter sources and degradation processes that occur in soils and sediments. Specifically, her approach of combining isotopic and 13C-NMR analyses has resulted in ground-breaking findings with regard to the processes involving the generation, transport and deposition of recalcitrant forms of carbon (char). Her current research is focusing on the degree of urbanisation on carbon cycling in the Logan estuary, the impact on increased salinisation on the Coorong and Lower Lakes ecosystems and on the potential of biochar as an agricultural amendment and as a carbon sequestration tool.

Thankyou for the opportunity to talk to you today about soil carbon, and the role it might play in the future in greenhouse emission policies. It was interesting listening to the workshop discussions and the summaries because there was a lot of discussion about uncertainty concerning agriculture and how it fits into the emissions trading schemes (ETS). I believe the uncertainty surrounding soil carbon is even greater. However, despite the uncertainty I believe there is a great opportunity for soil carbon to make a difference in future policies to reduce net greenhouse emissions.

My talk will essentially cover several aspects of this issue, and I'm going to go from the general to the specific and then go back to the general.

First, I will cover soil as a reservoir of organic carbon and give you an idea how big it is in terms of other carbon sinks. Then I will talk a little bit about soil organic carbon as not just one lump of black stuff in soil, but actually as something that is made up of different pools, and the function those different pools of carbon perform in soil. My talk will then go a little bit more into the specifics by looking at one particular form of organic carbon – biochar – and discussing what role it might play in sequestering carbon in soil. Finally, I will conclude by discussing other carbon sequestration options for soil.

Soil carbon is very significant in terms of the global pool of carbon. If you just look at the global

Carbon pools	Gt	% of total
Atmosphere (CO_2-C)	780	28
Biomass (plants, animals)	550	19
Soil (0 to 1 metre depth)	1500	53

Table 1: Estimates of the size of different global pools of carbon.

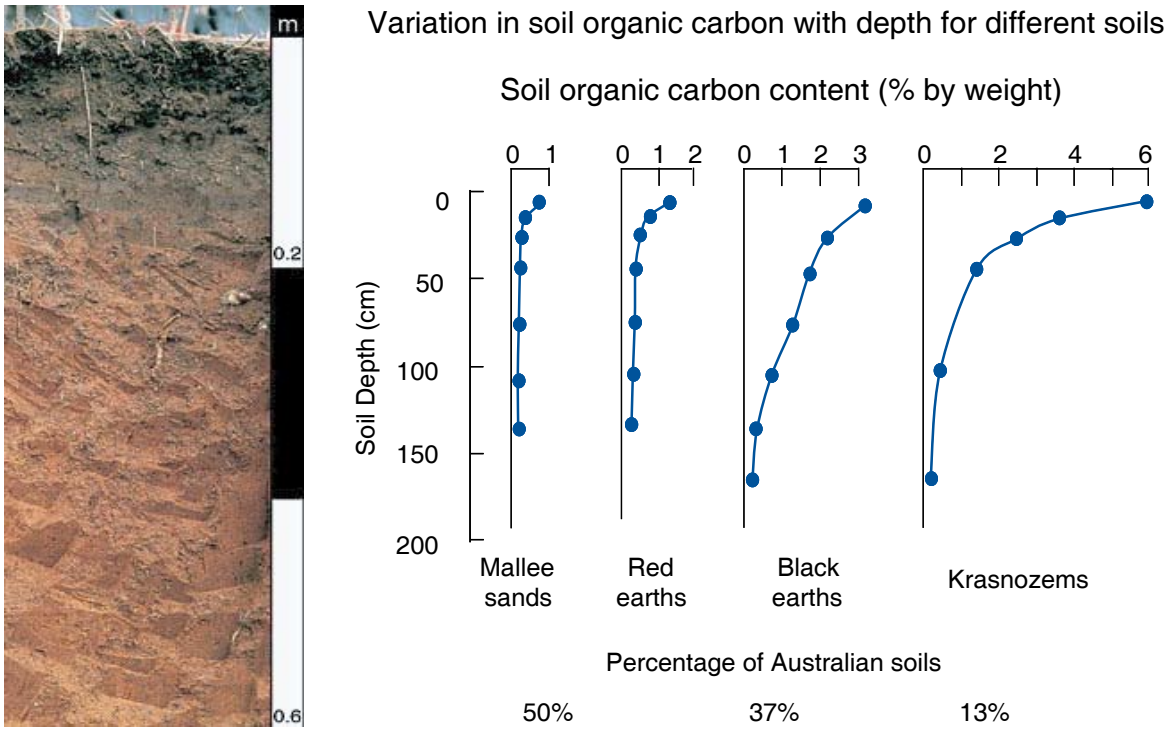


Figure 1: Soil carbon profiles of different Australian soil types.

carbon balance sheet you see that in terms of the comparison between biomass and soil there is vastly more carbon stored in the upper metre of soil globally than in all the plant and animal biomass. In fact, there is about 2.7 times as much carbon in soil than there is in the living biomass. This suggests that the soil provides a large opportunity to store more of the world's carbon.

However, not all soils are the same and not all soils can store the same amount of carbon. The above graph (Figure 1) shows the differences in soil carbon levels in different soil types that occur in Australia.

What all these soils have in common is that there is more carbon in the upper horizons of the soil than there is at depth. However, Mallee sands and red earth are comparably lower in carbon content compared to black earth and krasnozems. Unfortunately in Australia most of our soils are the sandy, low carbon content type soils that have the capacity to store less carbon compared to black earths or krasnozems.

In terms of oil organic carbon fractions, the group at CSIRO Land and Water, Jeff Baldock, Jan Skjemstad, who is retired now and myself, we've worked a lot on trying to separate this lump of organic carbon into biologically significant pools which allows a better assessment of the roles that each of these pools plays in maintaining soil health, but also to enable us to model long-term changes in soil carbon. The following graph (Figure 2), that shows changes in soil carbon under different management systems, provides an indication of why these different soil carbon pools are important.

Figure 2 shows what happens to total soil organic carbon when a change is made from a wheat fallow rotation to permanent pasture. The good news is that, while soil carbon declines during the crop rotation, it increases again once that land is planted to pasture.

If we just consider the evident trends on either side of the point where the management change occurs, it is evident that the recovery in total soil carbon levels occurs more quickly than the decline, which is also positive from the perspective of a

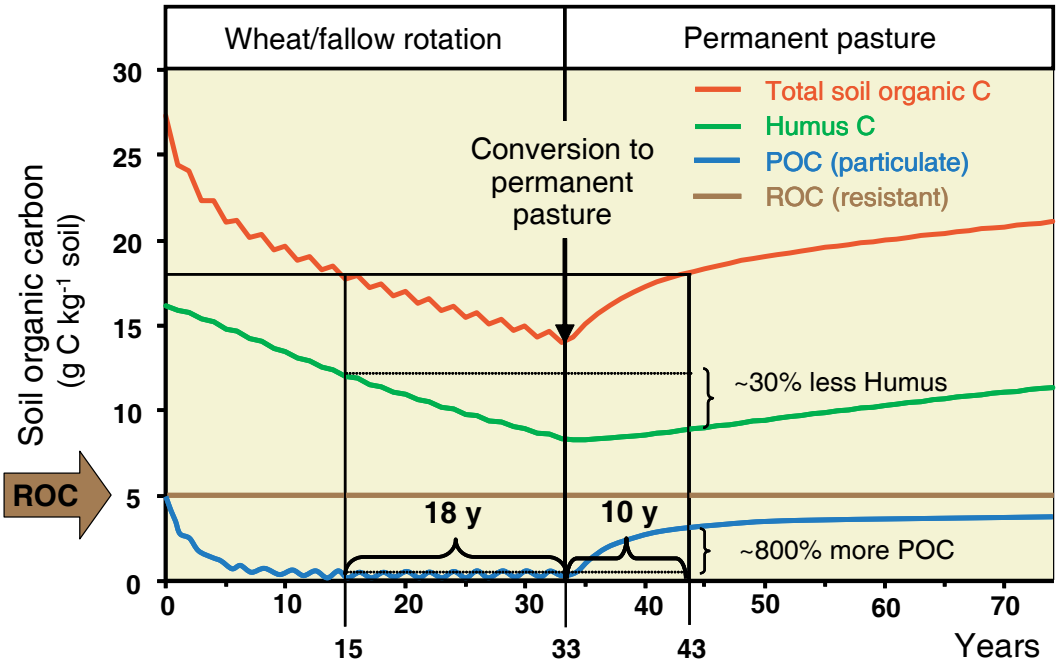


Figure 2: Changes in soil organic carbon fractions under different management.

landholder. But, unfortunately, the story is not all good news. The rate of recovery of the humus pool, which is important because it provides such things as cation exchange capacity that is really important for nutrient use efficiency, is much slower. The POC or particulate carbon organic pool, which is composed mostly of plant fragments, provides mainly energy to the microbes, has increased by a large extent quite quickly. The resistant organic carbon pool has stayed more or less the same because fire (which produces charcoal) has not been part of the management system. So essentially, the management change has resulted in similar levels of total soil carbon being observed, but changes in the components of that soil carbon, with 30 per cent less humus and 800 per cent more POC. This change will impact on the functioning of the soil. It particularly impacts, for example, on things like nutrient use efficiency and is related to soil cation exchange capacity.

What I would like to focus on in this talk more specifically is the ROC or Resistant Organic Carbon pool which mostly consists of charcoal. Charcoal is a natural component of Australian soils because fire is part of the nation's natural systems. In my discussion, however, I'm going to look at an engineered form of charcoal and this is what is referred to as biochar.

What is biochar? Biochar is charcoal which is produced by pyrolysis of biological material – usually mainly plant residues and waste. A characteristic of biochar is that it's highly recalcitrant, meaning it's very stable in the soil. Biochar doesn't decay very easily due to its chemical structure and it can become part of the soil ROC pool if it's incorporated into the soil. The benefits are the potential for biochar to be carbon negative, but please note the word potential. The application of Biochar to the soil can be a carbon sequestration tool. It has the potential to increase soil productivity and the potential to indirectly reduce non-CO_2 greenhouse gases such as methane and nitrous oxide emissions.

The reason I use the word 'potential' is because the number of studies on the results of biochar applications are currently limited and they cannot be generalised. Having noted that qualification, what are the potential mitigation benefits of biochar? The direct potential benefits are long-term carbon sequestration and an increase in soil health and productivity. The indirect benefits are decreased

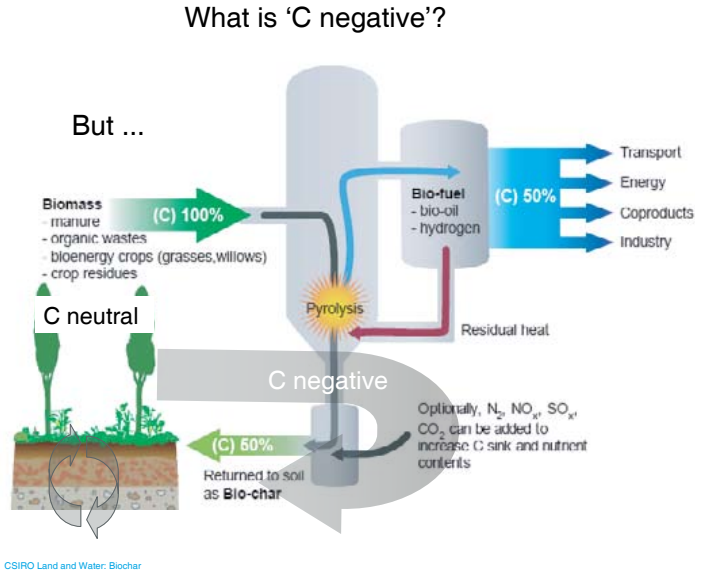


Figure 3: The biochar production process.

methane emissions as a consequence of avoided land fill, reduced CO_2 emissions from soil, and an increase in nutrient use efficiency, meaning reduced use of fertilisers.

There are, however, some areas of uncertainty. On the issue of carbon sequestration potential, there is some uncertainty but it's relatively small in terms. When it comes to issues such as the potential impact of biochar on soil health and productivity, the uncertainty is somewhat greater. On the issue of reduced methane emissions due to avoided landfill, the uncertainty is small because it's simply a function of the amount of vegetation waste not included in land fill, converted to emissions using the appropriate accounting methodology. In relation to reduced N_2O emissions from the soil, these uncertainties can be quite high so even with existing uncertainty this could have a big payoff, so there is really a lot of scope to do more research on this.

I have used terms such as pyrolysis and carbon negative in my talk so far. It is important that we all understand what these terms mean. To start, in the normal carbon cycle carbon is removed from the atmosphere by plants through photosynthesis and stored in biomass, some of which is retained in the soil and some of which returns to the atmosphere. This is considered a carbon neutral process. Over time, the fixation of carbon from the atmosphere and the release of carbon to the atmosphere remain in balance and are approximately equal.

How then, can a process be classified as carbon negative? If some of that carbon from the vegetation (in which form it is unstable and breaks down over a relatively short period of time) is turned into a very stable form of carbon like biochar and incorporate into the soil, then the process is essentially sequestering carbon. This sequestration only occurs if the conversion of the unstable plant carbon to stable biochar carbon occurs via pyrolysis, which is a process of heating the biomass in a contained unit with zero or limited oxygen. If the plant biomass is simply burnt, most of the carbon is released as carbon dioxide into the atmosphere.

Another positive benefit of this process is that it also results in the production of a combustible gas, which can be used to power the pyrolysis process and also can be used as a bio-energy for energy demands.

While this process looks very promising, it will only remain carbon negative if there is not a requirement to transport the biomass thousands of kilometres from the area of production to the pyrolysis unit and back into the field. The emissions from the diesel used in transport would potentially

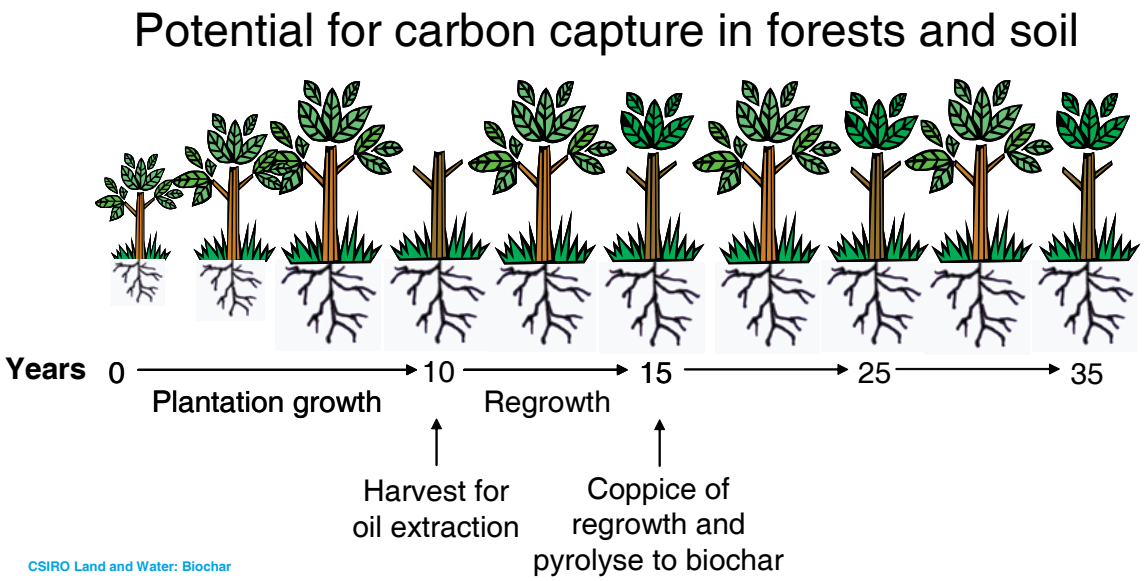


Figure 4: Process for plantation production of Mallee trees.

offset some of the carbon benefits that would be gained through the process. This highlights that it is important to really take into account a full life cycle analysis of carbon flows when considering these processes.

I will now talk a little more about the carbon cycle. The natural terrestrial carbon cycle, as I said, is considered carbon neutral; it involves photosynthesis, plant carbon production, the addition of plant residues to soil, the formation of soil carbon, and the decomposition of some of this carbon to produce CO_2 which is released back into the atmosphere.

Whether or not the reservoir of soil carbon is small or large will be determined by the long-term balance between carbon inputs and carbon outputs. If more carbon is put into the soil as a result of increased plant biomass production, or if less carbon is removed from the soil as a result of reduced erosion or decomposition, the result will be a net carbon gain. The maximum amount that soil carbon can be increased by is determined by the mineralogy of the soil. A clay soil, for example, will be able to produce and sequester a lot more carbon than a sandy soil.

Now considering managed systems such as forest or agricultural systems, the difference in this case is that these systems are actually taking plant carbon out of the cycle via harvest. That means that no plant carbon is being returned to the soil so the result is a net carbon loss. In particular, the system will be resulting in a net carbon loss if the products are ones that are easily decomposable products, such as paper. However, if these products are converted into long-lived products, such as housing timber or furniture, the process can be actually considered a modulator in the whole carbon cycle and will result in the storage of the carbon for longer periods of time. Another option is to take the waste products from the timber industry or the agriculture system and, instead of putting it into landfill or allowing it to decompose, converting it into a stable form of carbon such as biochar.

So essentially, the carbon sequestration options are that you can either increase the carbon stored in plants, for example you can grow a forest, or you can increase the amount of perennial plants that you plant. You can move more carbon into long-lived products or you can convert organic waste materials to biochar and apply them to soil. The last option has a lot longer time frames associated with the storage of carbon than all the other options.

The question is, how does it work in the real world? Again I'm taking an example from forestry here because that's probably the best modelled systems.

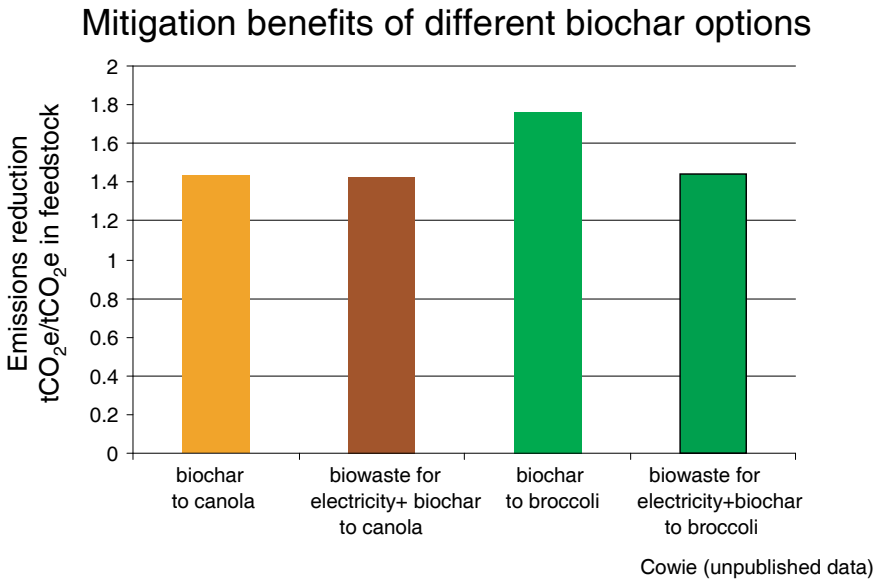


Figure 5: Mitigation benefits of different biochar options

If there is a new forest that is not being thinned or harvested, the rate of sequestration of carbon levels off after a while as Richard also showed in his presentation. If the forest is harvested, the amount of stored carbon is depleted back to the original baseline, and it is only if the trees regrow above the size they were when harvested will sequestration again be considered to be occurring. However, if the trees are harvested then turned into long-lived wood products rather than paper or pulp is there actually an increase the carbon stored in biomass, and therefore sequestration is considered to have occurred.

Now I am going to take this example into the whole soil scenario and actually show you that there are greater gains to be had than just the increase in biomass. Figure 4 below shows an example which involves growing Mallee trees for eucalypt oil harvest. After planting, the trees are allowed to grow for about ten years, before the first harvest occurs. This harvest involves heavily pruning the trees, and distilling the plant matter harvested in order to extract oil. The plants are then allowed to regrow and harvested or coppiced every 15 years. The waste biomass material left after the oil is extracted is pyrolysed to produce biochar.

This system results in an increase in the above-ground biomass which is periodically harvested, and there is also an increase in the below ground biomass through root growth and also as through plant matter carbon being added into the spoil. This increase in below ground carbon levels off over time. However, because the trees are being harvested periodically and the residual material is converted into biochar that is applied to the soil, there is an increase in the size of the stable soil carbon pool – the ROC pool – over time. If we analyse the CO_2 sequestered by these three different processes, the result is that over 50 per cent of the CO_2 sequestered is actually due to the biochar that is put back into the soil. As a result, this system has a much greater potential to sequester carbon over long periods of time compared to the other options.

It is important to understand that 'biochar is not biochar!' Biochar produced from different feedstocks produces different mitigation benefits. Figure 5 above, is the result of research by Dr Annette Cowie (University of New England). It shows the potential emission reduction associated with applying biochar to different agricultural commodity production systems, either in isolation or also in combination with the use of bio-energy. All the bars have a similar height but they differ slightly. The next chart (Figure 6) shows why they differ.

The main result is that using bio-mass to produce bio-energy results in a lot less carbon being

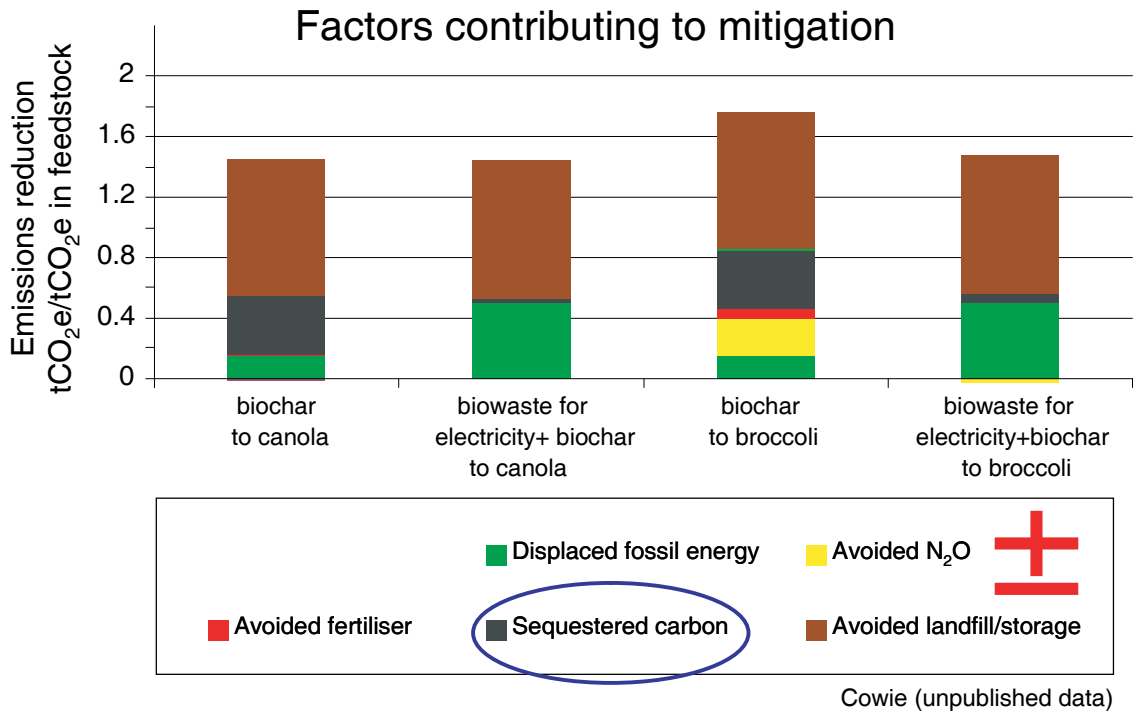


Figure 6: Factors contributing to greenhouse emission mitigation utilising biochar.

sequestered in the soil and this is the main factor leading to a difference in the height of the bars. This highlights that is competition between bio-energy production and biochar production. If a system is optimised for bio-energy production then less biochar can be produced. If the system is optimised for biochar production the result will be less bio-energy produced. What these graphs also show is if the biochar is applied to the soil, the result is a greater emission reduction than if you use it for bioenergy production. Again I want to highlight that the estimates for avoided N_2O emissions in the above graph have a high level of uncertainty.

In terms of biochar as a soil amendment there is a lot of discussion of not just using biochar as a carbon sequestration tool but also using biochar to increase soil productivity. The extent to which this might occur is a function of the feedstock that is pyrolysed, the specific conditions (temperature etc) of the pyrolysis process, and the manner of application of biochar to soil. It also depends whether you apply it to sandy soil or clay soil. Essentially, as I said earlier, the take home message is that 'biochar ain't biochar.' If we take an example of biochar produced from chicken manure and biochar produced from timber, they both look black but they are essentially different materials. They have totally different chemical properties and they will behave differently in the soil.

This creates a dilemma, as does the reality that biochar is currently not appropriately recognised in international greenhouse accounting rules. My concern is that we actually cannot afford to wait until it's accepted by the international community, because the voluntary sequestration market is ready to go. I am getting calls every week from farmers who are asking me, 'What is this biochar? How can we use it in our soil?' We don't have the answer yet but the important other thing is that we cannot afford to get it wrong because once biochar is in the soil it is so stable you can't get it out. If we give our farmers the wrong information and as a result they permanently reduce the productive capacity of the soil, there will be a major problem, and a very rapid loss of confidence in the potential of this technology.

The current research on biochar that I'm involved in is part of two large projects, funded by the GRDC

and by DAFF. The potential future proposals are application to the sugarcane industry as well as amendment to vineyard soils. Researchers are getting a lot of interest from these particular industries and I am hoping that funding will soon become available for research in these industries.

In concluding I want to make a few comments about biochar. Because of the ignorance about what biochar is, there is a lot of rogue biochar production occurring. Some people seem to think that because they produce something that is charry, they can call it biochar, and sell it and make a lot of money. However, as I have already mentioned, the value of biochar as a soil treatment depends on the feedstock used to produce it. Also, if the gases are not properly captured during pyrolysis, it becomes a health issue and it also does not do anything in terms of emissions reductions. This reinforces that it is really important not to create the opportunity for this sort of behaviour.

The other thing is that there is a lot of talk about biochar, suggesting that it's the best thing since sliced bread and will solve all our climate worries. That is not the case. Biochar can only work as part of a whole consortium of emission reduction policies. In addition, there is a lack of agreed accounting methodologies, so biochar cannot be incorporated in a carbon trading scheme, but it can be used as tool for enhancing productivity. What biochar needs is a lot more data and some serious modelling of different production systems so there is good understanding of the emission outcome of alternative systems.

The take home messages are there; that atmospheric CO_2 can be reduced by capture and storage in forests, soils, long-lived products and biochar. However, an alteration to land management practices will be required to increase carbon capture in soil. The amount of carbon present in soil is defined by the balance between additions and losses. Different soils can hold different amounts of carbon, and changes may be slow depending on the situation, climate, soil type, property history and a range of other factors.

Thank you for your time and I also want to point you to the biochar review that's in your conference proceedings and also the new book is out, *Bio Char for Environmental Management Science and Technology*.

Panel Session: Richard Stanton, Roger Hegarty & Evelyn Krull

Q. In regard to the rumen manipulation, if you equate it to developing a medicinal drug; it has to go through a lot of research, trials and so on to become commercially applicable. What price do you think carbon would have to be for it to be a commercial application?

Roger: I don't think anybody's been down that track yet. Not even the very financially minded New Zealanders. They just want a solution.

Q. My question is for Evelyn. There has been research carried out by Mallee Sustainable Farming Systems in the hotter, drier environment in the Sunraysia and Wimmera regions. Using conservation farming practices under loam or sand-loam soils, farmers haven't been able to achieve significant increases in carbon in their soils and yet they have used very good management practices. In addition, your comments in relation to biochar seem to indicate some uncertainty about its viability. What role do you see for agricultural soils in the Australian ETS, and what are your thoughts about how the issue might be managed?

Evelyn: In Australia, the biggest constraint we face in managing soils is water availability and soil water retention. Currently there is a large amount of research going on to try to answer that question that you just posed because it is a very difficult question in terms of the soil carbon dynamics and the role of soil in the ETS. In relation to biochar, the transport costs don't need to be high because there is no need to have industrial sized pyrolysis units. I think that a whole industry could develop for pyrolysis units that can essentially be hired out. These would be small units that can be transported to the farm that can stay there during harvest season, and produce the biochar. They could feasibly be operated by local farmer groups.

Q. A further question for Evelyn about biochar. How extensive is the body of knowledge on the potential negative impacts of too much biochar placed into the soil. As you said, it is being promoted as the best thing since sliced bread but if it sits in the soil for a long time it's quite important for us to know whether there might be any negative impacts from adding too much to the soil, or adding it to the wrong soil type. Any comments you have would be appreciated.

Evelyn: That's a very good question. That's actually the one aspect that worries me the most because oftentimes there is the opinion that the more the better. There is no research available that has actually examined this question. As I have tried to point out, it is also essential to remember that different soils will respond differently. For example, it is likely that a lot more biochar will be able to be added to sandy soils compared to clay soils where you run into the danger of clogging up the pores and actually creating a lot of problems. Some studies say essentially you shouldn't put on more than 800 tonnes of biochar per hectare. That's a very, very large amount. Most studies look at 10, 50, 100 tonnes per hectare. Again there is no number

that is necessarily safe and that's a very important question that needs to be answered before we can actually advocate it as a safe tool for farmers.

Q. A question to Evelyn. You showed a very dismal graph of soil carbon declining after a series of crops. Is it possible with current cropping systems to at least maintain soil carbon levels? A second question arising from discussions this morning is that as time goes on we're likely to see a change in land use, to some extent at least, with a move away from beef and into cropping. What's that going to do for our soil carbon once we shift from pasture into cropping? Will there be a large amount of soil carbon released as a consequence of that change?

Evelyn: The fact is if a farm changes enterprises from pasture to cropping the result will be a release of soil carbon. Cropping takes carbon out of the soil, and it is exported away from the farm as harvest. Your first question was basically do we have to deal with this sort of constant decline that this graph was implying? No we don't. There are management options available to turn this around or maintain a status quo that is adequate for managed systems. Things like stubble retention, longer phases of perennial pasture production, all these can help to stabilise the soil carbon pool. Having said that, any management options involving a change from a natural to a managed system will decrease soil carbon and nitrogen, and will result in some initial emissions of greenhouse gases.

Q. Richard, could you just explain why there's such a debate about whether wood timber products in housing etcetera, should be considered to be a permanent store of carbon, and therefore recognised as a long-term sequestration? What are the arguments about that issue?

Richard: There is a certain level of acceptance that timber products are a carbon store. I mean it can't be denied that the wood contains carbon and under the reporting arrangements countries can report estimates of the amount of carbon that is stored in that way. Australia's accounts as I understand it do show the increase in carbon store as a result of essentially the extension of Australia's housing stock. Because we've got more houses and people live in bigger houses. The question is whether that would actually be credited in a trading scheme. So there's an acceptance that it's out there and that we can measure it but the question is how do you give credit for that in a trading scheme? We are certainly trying to work through options how you might do that. I mean do you say to someone, 'Well if you go and build your house out of wood, you've got a carbon store there; we'll give you so many credits for the carbon stored in your house.' Or do you give it back to the grower who grew the log that turned into the timber? As you can see there is a whole range of issues about how you would incorporate it into the CPRS to encourage increased forest production and so send that price signal to increase the size of the store.

How Can Agriculture be Included in an Emissions Trading Scheme? Some Thoughts from New Zealand

Suzi Kerr

Motu Economic and Public Policy Research

Suzi Kerr is senior fellow researcher and co-founder of Motu Economic and Public Policy Research, a non-profit research institute that carries out long-term, socially beneficial research programs. In her current work, Suzi empirically and theoretically investigates domestic and international emissions trading issues with special emphasis on land use and climate change in both the tropics and New Zealand, domestic carbon permit market design, and nutrient trading in Lake Rotorua. This work involves theoretical analysis, simulation modelling, econometric analysis and policy design. Suzi works closely with researchers and other collaborators on these issues, in particular in her work with a collaborative network, Ecoclimate, involving researchers from several Crown Research Institutes. Suzi got her honours degree from Canterbury and has a PhD from Harvard University.

Thanks for the invitation to be here. It's great to be in Australia and learn about what's happening on this side of the Tasman. We're so involved in our ETS issues in New Zealand we don't usually have time to look west. I have gained the impression that there is a bit of gloom in Australian agriculture about how this might all potentially play out, so I want to try and impart a more positive view of things.

New Zealand went through a very intensive design process on agriculture emissions trading last year and at least one of the people in the room was involved in that process. I won't say that it was fun or easy. What became really obvious was that this is a very hard problem and also that the research and academic knowledge that's necessary to make these sort of systems work is lagging behind what the policy-makers need. That makes things very difficult. But that said we did really learn a lot through that process. I am advised that the report from it is now available on the web and it summarises where we got to in our thinking but it certainly wasn't a final conclusion.

Why is New Zealand considering including agriculture in its emissions trading scheme? The answer for this question is that for New Zealand, it's pretty much a no brainer. Agriculture is the source of nearly half of the nation's emissions so if we want to contribute to global mitigation and if we want to cost effectively comply with our Kyoto agreement we really have to include the sector. That reality is something we're going to have to deal with at least in the long term if not in the short term.

In my talk today I'll just start with a very broad overview of emissions trading just to make sure we're all on the same track and then I'll talk about some of the specific challenges in New Zealand and some ideas about how these might be addressed.

Agricultural greenhouse emissions trading is operating as a nested system within the global emissions trading system. New Zealand is part of the global emissions trading system. We as a country are a participant in that system and we have a free allocation of greenhouse emission units, called our assigned amount units. New Zealand can supplement those with carbon sequestration, which we hope to do, and we can also buy additional units on the international market or conceivably sell some if we find that we have excess. There's no question that we're involved in that international emissions trading system.

The way that that international emissions trading system works is that New Zealand has to prepare a national inventory every year, with national emissions calculated according to IPCC emission accounting rules. Each year the New Zealand Government has to surrender assigned amount units to match the emissions calculated under that accounting system.

The question we're here today to look at, is how we take that global system which New Zealand is involved with and is participating in and work out how to devolve that down to a local level. If we take the point of obligation at the farm level, the way that it works functionally is that the Government will issue tradeable units to farmers either by providing them or by allowing them to buy them, and then farmers will be responsible for monitoring their emissions on farm. They will then report those to a government agency and be required to surrender emission units equivalent in number to their farms' calculated emissions. An alternative to the farm level obligation is to have the point of obligation at the processor level, with the processor responsible for the emissions estimated to be created on the farms of their suppliers.

What are the big challenges in including agriculture emissions in a trading scheme? The first one is choosing the point of obligation for farm emissions. The answer to that question is very, very heavily dependent on the way that you report and verify emissions, and how easy that is to do and how reliable that is.

The second issue, which was discussed extensively at the dinner last night, is the issue of leakage. It's not nearly as big an issue for agriculture as it is for some of the other sectors where it is conceivable that an entire sector could relocate from New Zealand because it is easy to relocate a factory, whereas in agriculture it is not possible to move the land. You can, of course, introduce policies that result in a change in land use but it's slightly less of an issue to that associated with a whole sector relocating offshore.

Distribution impacts of any policy are really important to understand, and this was a third issue that needed to be considered. I think you had a presentation on the projected impacts of the CPRS on Australian agriculture yesterday. We have some reasonably reliable numbers now for New Zealand and, without a free allocation of emission permits; it will really impose a very large burden on some farmers if agriculture is included in the New Zealand ETS. On all farmers, it's a burden, but on some it's really quite an acute burden.

Finally, one of the key issues that needs to be considered is compliance particularly for agriculture emissions. There is not much point designing a scheme if it is impossible to be sure everyone is complying with it. Compliance is an issue I'll come back to later.

Point of Obligation

One possible point of obligation for farm sector emissions is the dairy or meat processing plant. The advantages of this are it's relatively easy, there aren't a huge number of them and they've got very good data on the amount of product they're managing and this is verifiable data. As a result, while the potential requirements of a scheme are not trivial, it's a relatively easy thing to establish. If we adopt that approach, the cost of production and the cost of the products of those industries for New Zealand consumers will increase because the processors will probably be able to pass some of the extra costs on. This approach also spreads the cost of Kyoto Protocol compliance into the agricultural sector as well as some of the other sectors. The other advantage, which may not seem like an advantage to those in the agricultural sector, is it would make farm-level obligations look much more attractive because the processor-level obligation is not a very attractive option for farmers.

The big disadvantage of processor-level obligation is that all it encourages is reductions in output. Processors will only know how much is produced, and will not have any information about the emissions efficiency of different production systems. The result is that processors will be unable to provide incentives to reduce the emission intensity of farm outputs. That is a big disadvantage.

Why consider having the point of obligation at farm level? One of the strongest reasons is to overcome

the disadvantage I have just identified with a processor-level point of obligation. Mitigation options that actually reduce greenhouse gas intensity all need to be monitored on the farm, because there is no way to identify whether milk or beef at the processor came from a low or a high emission farm. We did consider trying to get some data on this at the processor level but it didn't look like a promising option. It is essential that any scheme that is developed provides farm level incentives and one of the things that our group did conclude almost unanimously was that in the long term, a farm level point-of-obligation is the optimal solution. Having agreed that, the difficult question is what can be done in the transition period and how quickly can that occur.

Reporting and verification are the critical issues. I'm sure most people here understand that it is not possible to directly measure agricultural emissions, unless we are talking about a very small number of cows in a very small paddock! That means the need for systems based on models that convert information about activities into estimates of emissions. In New Zealand, we are lucky that we have an online computer model that is in broad use already. It's called Overseer, and it's run by AgResearch. The model was developed for dairy farms under a previous agreement relating to water quality rather than agricultural emissions, so dairy farmers are already using Overseer on their farms. This is not a new technology. It's a relatively easy thing to do if you are using the simple version of the model. Although it's being used currently it's not part of a regulatory framework so the data that goes into it are not being verified. Verification of data is an additional element that needs to be added to the system. There are also some challenges associated with the structure of Overseer, which isn't ideally set up for greenhouse gases, but those are being worked through by the scientists. Operators of sheep and beef farms could also use Overseer, and it is not a hugely expensive model to use. The information that farmers are required to provide can be estimated based on data that is already provided to people like the tax authorities and so there are verifiable data that can be used to go into it but it imposes a reasonable cost on a farmer, particularly when you are talking about very small properties.

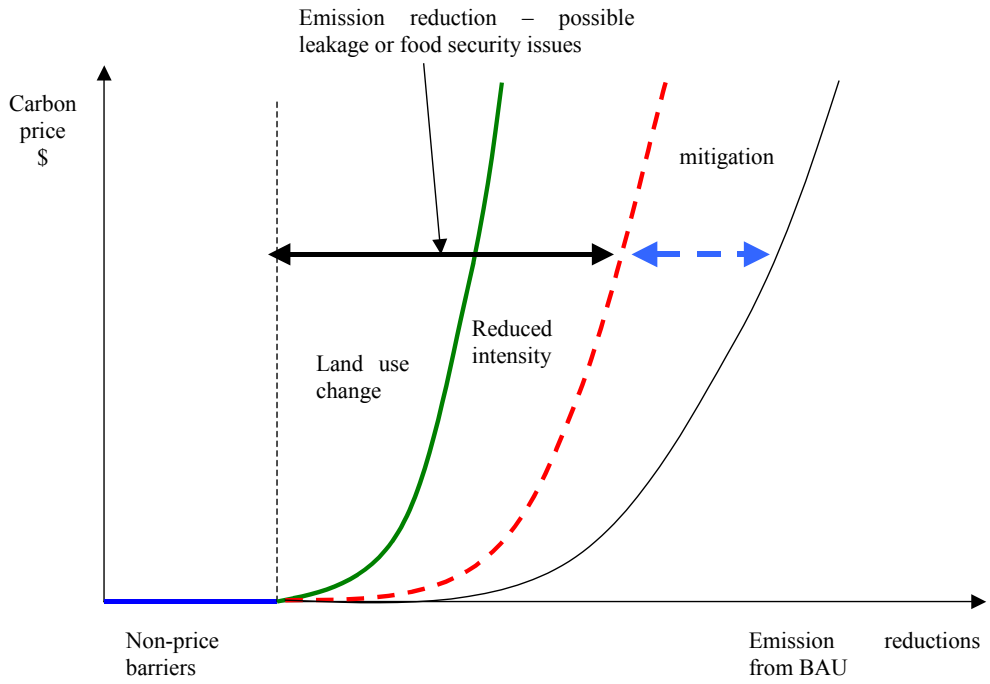


Figure 1: Agricultural emission reduction possibilities, New Zealand.

What would New Zealand be gaining by moving towards emissions trading in agriculture? Is this really a worthwhile thing? To answer this I will refer to Figure 1. Along the horizontal axis is the amount of emissions reductions from business as usual. And there are a number of emissions reduction options that various people out there are saying could be done anyway and therefore agriculture should be in the ETS because there are emission reduction options for farmers that need to be incentivised.

The hope is that by including agriculture in the ETS, it will create sufficient incentive for farmers to adopt some of these practices. However, as an economist, I have to observe that if farmers are not currently carrying out these activities, there are probably some good reasons why they're not doing them and we call those non-price barriers. So there are some options that might be very, very cheap out there in some sense but there are reasons why farmers don't want to do them because they don't fit in with their general farm systems.

So I don't think those are things we can expect a price based system to induce magically all of a sudden. So, essentially I think that those can be ignored from the point of view of emissions trading. However, there may be other complementary government policies that would induce those actions by farmers.

Then the next option is to actually change land use. That is something where there is some empirical evidence in New Zealand. We think that at about a price of $50 a tonne CO_2-e you might get in the order of a 10 per cent reduction in emissions through land-use change (reduced livestock) and if that land-use change is into forestry, which is highly likely, there will obviously be some sequestration of carbon occurring as well. In total it is probably not a huge volume of emissions, but it's a start.

Then for the farms that are pastoral farming – because pastoral farming is really where all the emissions arise in New Zealand – the second option is to reduce production intensity. The current evidence from some farm models is that farms in New Zealand are overstocked, but the evidence is not terrifically strong, and some of it is actually a little contradictory. This is particularly the case for some dairy farms. Some argue that they have adopted intensity levels that are too high, but others are saying that it's not really a price sensitive thing, and that you either operate at optimal stocking rate and optimal production levels or you change your land use. The conclusion is that there may not be a lot of options available that would result in reduced intensity, but there is not very good evidence available on this subject.

The third possibility is mitigation, which entails maintaining farm production but doing it in a less greenhouse emission intensive way.

There are a number of issues associated with each of these. If reductions in greenhouse gas emissions are achieved by land-use change or by reducing the amount of farm output, then this could be leading to international emission leakage and potentially exacerbating food security issues. It is not entirely obvious that those are emission reductions that are 100 per cent useful. The intent of concerted global action is not to have New Zealand's emissions fall but to have them increase in Chile or China, the point is to reduce total global emissions. The big challenge is to find ways to reduce New Zealand emissions in a way that avoids these undesirable outcomes.

What about the mitigation options? I know you had a session on this yesterday afternoon and I'm sorry I missed that. However, as I understand the situation the options are not really a very long list, especially if it is constrained by the emissions accounting rules of the Kyoto Protocol. There are a lot of possibilities that people talk about, but most of them don't have strong enough science to include them in an inventory or there isn't the data to be able to include them in an inventory. As a result, these can't be included in an emissions trading system yet; unless the Government wants to take the risk associated with that.

The major options for reducing methane output are to reduce stock numbers and production or to increase productivity. By productivity in this case I mean the amount of output (meat, wool or milk) per unit of dry matter utilised. Growing animals faster, having animals that produce more milk, having

higher lambing rates. These are the sort of things that farmers want to do anyway but this would be an additional incentive to improve productivity.

Nitrous oxide emissions can be mitigated by reducing the number of animals, reducing fertiliser use, the use of nitrification inhibitors, and there are also wintering off possibilities that involve taking animals off waterlogged areas and putting them on better drained soil over winter. These options will reduce emissions but the reductions may not be large, and there is not a lot of good evidence on what the cost is of doing these things. There is a great deal of uncertainty about whether these would be profitable options for many farmers as the emission price went up, and how much it would really cost in terms of their overall farm business profitability. There are some other options that could conceivably be used, but again they may be quite limited in terms of their applicability in New Zealand agriculture.

I now want to discuss the issue of agricultural emission leakage. From the previous discussion, it is evident that there are some mitigation options available, but these may only result in relatively small emission reductions. There are many other possibilities and it may be that there are some really good mitigation options that will emerge over the next decade. In the meanwhile, if there is a high level of concern about leakage and emissions simply moving offshore to other countries that aren't covered by the Kyoto cap then there are a couple of ways that this can be dealt with.

The first is what is termed 'output-based allocation'. If a farmer is allocated free emission units on the basis of current annual output, then essentially it's like a subsidy to output. It means that there is not really pressure being imposed on farmers to reduce output, and therefore international emission leakage will not occur. Farms still have an incentive to reduce emissions intensity if this is a farm-level system (because the less emission units required by the farm, the more the farmer will have to sell and convert to income), but there's less of an incentive to reduce output, which results in the leakage problem. The limitation with this approach is that there is no incentive or a much reduced incentive for consumers to change their diets to reduce consumption of high-emission products, which is part of the long-term optimal response.

The second way of addressing leakage is the idea of border tax adjustments and I don't know how much that's been discussed in the Australian context. The problem with leakage is that New Zealander and Australian farmers will face a price on their agricultural emissions and the countries that compete with our nations in international markets don't face those costs, because they're not under the Kyoto cap, and it's likely they won't be under the post-2012 cap either. A possible approach to this is that for any product that's exported, the exporter would be rebated the emission units that were required by businesses in the supply chain for that product. This arrangement would create a level playing field with international competitors, and it's equivalent to exempting, or partially exempting exporters from the system.

It is unclear whether this policy approach would be WTO-compliant, and it is an issue on which there has been a great deal of discussion and debate. There will not really be a definitive answer until a nation implements this policy, and it is then subject to challenge and decision by an appropriate WTO tribunal. It is probably not a short-term option for legal reasons, but also because both New Zealand and Australia don't want to be seen as pushing something that may be conceived as trade protectionism, given the usual strong free trade stance of both nations.

Probably the biggest issue for farmers are the distributional impacts. The major impacts are going to be on farm profitability and that feeds through to land values. New Zealand experienced something similar to this when farm policy reforms were implemented in the mid 1980s. Farm subsidies were reduced across the board, and farm land values dropped dramatically, and virtually overnight. It is not beyond the realms of possibility to envisage something like this happening again, depending on how we manage the free allocation of emission permits. The policy has the potential to lead to a loss of farmer's equity in landholdings and potentially bankruptcy if they've got a lot of debt.

The long term losses aren't just related to the current output. Even those who aren't using their

properties very intensively at the moment, if that land could be used intensively in the future then that potential use will be reflected in land value. This is particularly relevant in New Zealand because for the owners of a lot of land that is currently underdeveloped (particularly forestry on high quality land and Maori land), they don't like the idea of allocation on the basis of current emissions, because their current emissions aren't very high. They have no or relatively few animals but they are intending to develop their land in the future and because of that future potential their land is much more valuable than its current profitability would suggest.

It is also important to remember that there will also be an impact of these policies on workers and regional communities. This includes people who work on farms, people who are working in farm supply and services, and people working in local communities. The flow-on impact will be considerable for local communities and some modelling has been carried out to show which local communities are likely to be very heavily hit per capita and will have some difficult adjustment challenges.

Free allocation of emission permits based on output is a policy that addresses the leakage problem, however it doesn't necessarily target assistance to those who lose most. It's potentially very good at dealing with leakage but it may not be so good in dealing with equity issues, which are likely to be politically very important. In either case if output-based allocation is being used then there will be a need to change that allocation over time as any global agreement emerges so it needs to be set up so that it will phase out as the leakage problem diminishes.

The big issue that we really came to in our discussions in New Zealand was that there was a fundamental disagreement within our group between the farmers and the Government about compliance. A lot of work was put into the design of a system that could work at farm level, but it depends on an enormous number of farmers filling out forms, reporting things, and ultimately buying emission units. This means you have to have most farmers supporting the system and complying voluntarily because otherwise there is no way to enforce the system. It is not possible to audit 80 per cent of the returns. It is politically not acceptable to be trying to impose fines on a large percentage of the farming community. This simple reality dictates that whatever system is implemented it has to be something that's broadly acceptable. The Government is very suspicious of that particularly given the very negative reaction in New Zealand to the greenhouse gas levy – the infamous fart tax – that was proposed several years ago. In response there were tractors on the steps of parliament. The cost of that policy proposal for farm businesses was minuscule relative to the potential cost of emissions trading.

At least in the short term there may be serious compliance trouble if a decision is made to implement a farm scale system, and it seems the actual emission gains aren't likely to be enormously high; and there is a great deal of uncertainty surrounding this because the science and associated modelling is too weak.

If these risks and uncertainties mean that governments are not willing to take the plunge and implement a farm-scale emissions trading system – which is probably preferable in the long term – then the obvious question is what options are available as a transitional policy?

One obvious first thing is that a tax could be implemented on nitrogen fertilisers at the manufacturer level. This could even be part of a longer-term solution, because there aren't very many manufacturers of fertiliser, they're easy to monitor and once the nitrogen fertiliser gets on the farm there's actually nothing that currently can be monitored that would make any difference as far as emissions go. The way that greenhouse gas emissions arising from nitrogen fertiliser are calculated is by multiplying the amount of elemental nitrogen applied by a fixed factor that reflects the average proportion of that nitrogen that will be emitted as nitrous oxide. This can be calculated just as accurately at the manufacturer level as it can on-farm. Farmers will then have an incentive to reduce their fertiliser use.

In addition, an ETS could be implemented at the processor level only as an interim measure using output-based emission allocation, which would be

easy to do because the output data would be readily available. The result would be a very low cost on agriculture implemented through processors and fertiliser manufacturers initially, and the advantages of that would be that agriculture would be seen to be contributing to the emission reduction effort. This may have some political benefits as well as beginning the process of change to a reduced reliance on nitrogen fertilisers.

Unless a global agreement looks likely in the short term, and I must say this appears unlikely given the current UNFCCC processes, I think that the preferred policy approach will require border tax adjustments when they're possible. Another option would be to have a processor-based system, and put the point-of-obligation at the farm level for dairy only. The New Zealand work involved a quite intensive examination of what we called a hybrid scheme, where some farm emissions are accounted at processor level and some were at farm level. It turns out to be very difficult because the fundamental way that you calculate emissions at those two points is completely different. At the processor level, the critical issue is emissions per unit of output, so it's over the life cycle of the product, whereas at the farm level the interest is in the level of emissions in a particular year.

When the two systems are mixed or used in combination, the result is a lot of possibilities for error and for potential manipulation of the system. Such a system might be possible in the case of dairy, and particularly if farms are primarily dairy and have very little interaction with the sheep/beef sector but there would have to be some quite complicated rules developed around those interactions. In New Zealand and I'm sure the same is true in Australia, there is a lot of stock movement between farms and even between dairy and sheep/beef farms.

Another possibility is to reward the nitrification inhibitors, which are currently the major mitigation option on-farm. That could be achieved directly rather than trying to do it through an emissions trading system, and would be an easier thing to do from a compliance perspective.

In conclusion, the decision was that it is possible to bring agriculture into emissions trading, but the monitoring costs are likely to be very high and compliance could be a real challenge; and in the short term it's not clear what the gains would be. In the long term all agreed that the best policy option would involve a farm-level point of obligation.

This is because it is very important to give farmers the flexibility to respond. It is important to encourage innovation, new ideas etcetera. In the long term I concluded – and this was not necessarily the group's conclusion – that free allocation should probably be based on the productive capacity of the land rather than on output because that's more closely aligned with who really loses from the system.

The outstanding question from a research point of view is, are there on-farm mitigation options that can be utilised that justify the cost of taking the whole system down to farm scale? That's something that we really need a lot of research into, both on the science of those options so that we can actually get them into the UN rules and work out what the potential is for those options in New Zealand; but also on the economics.

A major question, ultimately, is are we really saving a lot of money for farmers if we allow them the flexibility to use these farm-level options?

Thankyou.

The 'Point of Obligation' Question: Should Processors or Farmers be Made Responsible for Farm-Level Emissions in Australia?

Tom Maguire

Teys Brothers

Tom Maguire is the Chair of the Australian Meat Industry Council's (AMIC) Emissions Trading Scheme Committee. AMIC is the Peak Industry Council representing Australian meat processing and exporting companies. Tom has worked in the Australian meat and livestock industry since 1993. He currently holds the position of General Manager – Corporate Affairs and Innovation with the Teys Group of Companies. Teys is Australia's second largest meat processor and exporter.

Good morning and thankyou for the opportunity to talk to this conference today.

I am here to talk primarily about the point of obligation question, which was just highlighted in the presentation about the New Zealand experience. I think that it really highlights the enormous challenges we all face converting what is a really good theory, what looks good on paper, what sounds okay in committees; to something that can actually work within the real economy.

The first message I want to give you is we've really underestimated what we're going to need to do to make this work in the timeframe that people think it might work. I am going to stand here as a processor and try and convince you in the farm leadership world, that putting the point of obligation on processors, while it might be cheaper for government, is really not going to send any incentive message to farmers, and really will simply end up being a tax on production.

I'm also not going to miss the opportunity to highlight a couple of the points that Robert Poole made on behalf of the dairy industry. His main point was that we must, whatever we do, maintain a level playing field for ourselves in international markets whilst we're transitioning; and we must remember that the impacts of this scheme do not start for the agricultural sector in 2015, it starts as soon as other participants of the supply chain – especially processors – have CPRS obligations.

When you're dealing with the point of obligation question and just how this CPRS is going to work in the real world, you've got to start thinking about those people who are going to be required to make it work. And from our point of view sitting there as Australia's second largest meat processor, we start thinking about the farmer that sends 10 or 12 head of cattle up to one of our processing plants. We're thinking of their livestock agent, we're thinking of our livestock buyers, we're thinking of some of our accountants, some of our traders, some of the suppliers.

As a bit of background, the Australian Meat Industry Council, for which I am a spokesperson on emissions trading, is the peak council for the meat processing sector. Teys Brothers, my employer, process about one million head of cattle a year, and there's about eight million processed every year in Australia, so Teys Brothers make a fair contribution. Eighty-five percent of what we process is exported around the world primarily to the United States, Korea, Japan, more and more into Russia; and Europe is also an important

market for us. Not only are Teys Brothers meat processors, we're also feedlot operators, and cattle producers. Teys Brothers owns four large cattle stations throughout Queensland. We're trying to get ourselves into the value-added business. We run a hide processing facility and we've got some offices around the world.

In relation to the CPRS, we are in a similar position to Murray Goulburn, and have hit the jackpot as far as the policy goes. Teys Brothers is obligated under the National Greenhouse and Energy Reporting Act (NGERS) to report our emissions and we also have two meat processing plants that are estimated to be the source of more than 25,000 tonnes of direct emissions, and will therefore be required to be direct participants in the CPRS from 2011 – or 2012 as we learnt on Monday. The Teys Brothers processing plants that will have to participate in the CPRS are at Rockhampton and at Beenleigh, and these will be affected from day one of the CPRS.

I want to quickly highlight the importance of the meat industry value chain, not because I think anyone in this room doesn't know about it, but I think it's been forgotten about in this debate to a large degree. There were quite a few questions yesterday about the distortions that can happen when a policy measure picks off parts of the supply chain and impacts it but not other parts of the chain. The same issues arise when a policy measure impacts on one supply chain and not others in the same market. The answer to those question is that no one's got any clear idea at all what the final impacts will be.

What you see time and time again is when you do that and cause distortions in the supply chain you've really got no idea what the outcome is going to be at the time. There are a lot of hidden costs which it is impossible to foresee or model. For example in the meat industry at the moment, there are one or two processing plants in some areas that are going to have a CPRS obligation, and some plants that won't directly be liable under the scheme. For a real life example, Teys Brothers two biggest beef processing plants, which are required to participate in the CPRS, will be at an $8 to $10 disadvantage to Teys Brothers other two beef plants when they go into the very same market to purchase cattle.

How does Teys Brothers, as a company, respond to this problem? The company has a plant that does breach the CPRS threshold at Rockhampton, and an idle plant that could work tomorrow located at Innisfail. Commercially, it would be mad to open the Innisfail plant as it is less efficient that the Rockhampton one, but the CPRS rules are creating an incentive for us to do that. The result of a decision like this would be extra industry costs that can't easily be modelled, especially because some decision-makers seem to not understand that in the real world this has real impacts on farmers. Just ask a cattle producer operating out west of Rockhampton what the extra costs would be to truck cattle to Innisfail? These types of costs, the indirect costs, are the ones that are really going to be felt throughout the economy if we don't get this right.

I want to now focus on the issue of the 'point-of-obligation' because I see that as a very important issue that has not really been thought through sufficiently. Meat processors are really interested in this because when we sat down and thought about it, our first response was 'Oh here we go again!' The Government's got this great idea and we know the policeman will be the meat processors once again, because we're easy to find and easy to identify. We know the farm sector is responsible for about 16 per cent of national emissions and meat processing we think is responsible for about 0.4 per cent, but there's no doubt that collecting a tax at the point of processing is going to be more cost effective that trying to do it at the farmgate. But the question is who is it going to be more cost effective for?

Up until recent times, Teys Brothers has been involved in the Australian Government's Greenhouse Challenge Plus program, which has involved a commitment to calculate the emissions associated with each of our meat processing plants. We have found that to be a relatively straightforward exercise to be honest. There is still an issue about the appropriate calculation methodology for emissions from waste water which requires resolution. However, in terms of our other major emissions we collect bills from our suppliers, and that information forms the basis of our calculations. Our next step will be to set up a very good data verification system because we were

reporting voluntarily for a few years but now we've going to get a bill at the end of it, so we want to make sure it's right.

Now, we need to start to consider what might be involved in not only being responsible for our own processing plant emissions, but in also having the obligation to report on, and to buy emission permits to cover the emissions estimated to be created by our beef producer suppliers. Meat processors recent experiences with other, much less onerous and much less demanding industry programs provides us with some insights into what could be involved in being required to assume the responsibility for on-farm emissions.

There is a program just in the red meat industry called the Livestock Production Assurance Scheme. Any livestock producer who wants to participate in that needs to register. What we now know from that program is there are 200,000 beef producers who have registered, and they operate 213,000 properties. These are all real people. They've all got different numbers for their different properties and any one of those could supply us on any given day. So as a processor the first thing I'm thinking is, 'There's a lot of cattle producers I've got to get my head around if I'm going to manage this point of obligation thing and drive incentives.' Then I start to think about the information that I've currently got through the National Vendor Declaration (NVD). There are nine questions on that declaration and we insist on these all being completed for every consignment of livestock we get into our plants. We won't process anyone's cattle unless their NVD is 100 per cent right, because that's what our EU & US licence requires. On any day 20 per cent of those NVDs have errors. In each case, we have to send the form back to our livestock supplier, and work through it with them and get them to correct it. I'm raising that point because it provides some sense of the issues and complexities that might be associated with a meat processor being required to accept responsibility as a point-of-obligation for the CPRS, and to try and develop systems within that which would provide appropriate incentives for producers.

Much to the amusement of the table of people I've been sitting with, I was trying to listen yesterday to all the things I'd need to know about that affect soil carbon, and that I might therefore need to consider in developing an incentive program to encourage beef producers to reduce their farm emissions. It's perhaps not surprising that this is all new information for those of us involved in beef processing. But I am told these are some of the things I'd need information about from my suppliers if I was going to differentiate them on the basis of their emissions profile. I'm assuming I would need to obtain this information from responses to a set of questions, and then apply some sort of standard calculation methodology to work out the emissions associated with each consignment of cattle.

I think this illustrates that accounting for livestock emissions is going to be really complex and if I'm looking at doing a complex set of calculations for 200,000 individual businesses, I have no idea how I'm going to get that right. Based on our experiences with the simple nine questions on the NVD, there is no possible way to obtain all the required information in a way that makes sense economically or practically. Another point that hasn't even been thought about yet is that in Northern Australia 80 per cent of livestock come to us directly from farm, so we have a relationship with the producer, but in Southern Australia the reverse is true, and the vast bulk of livestock – over 80 per cent – are sourced through an auction and our only contact is with the livestock agent, rather than with the beef producer. In the sheep industry the situation is even more complex, because a single sale lot of sheep might be what we call a box lot, with five or six vendors involved. Good luck sorting what sheep came from where and what the emission profile was from each supplier.

If a decision was made to proceed with meat processors as the point of obligation for farm emissions, there will obviously be a huge red tape burden created. Meat processors are a bit skeptical about the accuracy of the information that the system would be based on. As I have already mentioned, there is already a big effort required just to get the nine questions on the national vendor declaration answered accurately, and it should not be forgotten that this effort involves cost. I already know what it's going to cost Teys Brothers as a

business to get our NGERS calculations right and squared away to the satisfaction of the legislation. The potential cost of the same effort by every livestock producer is something I can't even begin to contemplate. We're always told to adopt a 'can do' attitude in response to these sorts of challenges, but I can't even begin to get my head around how meat processors would implement and manage a scheme such as this. Really, at the end of the day unless the required information is available at the time meat processors are making decisions about those animals it will be very, very difficult for us.

Ultimately, the crucial question is 'is there a better way?' There is no realistic methodology available to accurately measure farm emissions at the moment, yet I think there is no question the only way this whole problem will ever be dealt with in a realistic way is for emissions to be managed on-farm, no matter how difficult it is. Before we even started down that road, the industry has to have a clear understanding of what all those costs would be. On this matter I think the previous speaker made a really good point that is applicable for any system that might be introduced. The point was that there will need to be good acceptance and almost a voluntary uptake of a system; in order for it to work. I say this because if we just take the red meat sector, I don't know how many people you would need in departments to enforce a system on 200,000 noncompliant producers. It's just not going to happen.

I've tried to provide you with a summary of the views of meat processors on the merits or otherwise of different concepts that are currently being discussed. We can debate these and I am sure we will, but it's important that we do have the debate, have a really good think about what the implications are on both sides, and think very seriously about the many critical implementation issues that will arise. At the end of the day, this debate has to get out of this room, has to get out of the Australian Parliament and has to be engaged in and understood by the people involved in real farms and real processing plants if we're going to make one iota of difference to emissions around the world. That's a real challenge and I think a really important role of bodies like this and our own organisation is to get out there and tell politicians and government departments that they'd better be thinking about these issues right now. There's no point in 2013 or 2015, saying, 'Well, we had better think about implementation.' That National Vendor Declaration I showed you before, which is a bit of a success story in our industry, took 12 years to implement. And that's just nine questions on one piece of paper.

Unless we get this transitional phase right, we can talk all we like about points of obligation but I think the locked gates will say it all. We will not be able to compete in international markets as we do today if Australia has a price on carbon that our competitors don't. We can do all the modelling we like, but it seems to me the result is pretty obvious. In fact, it was an interesting question yesterday when someone asked why there was such a big difference between ABARE's modelling results and the results of the work that CIE has done. The main difference in the assumptions was that ABARE assumed all our competitors implemented emission policies at the same time as Australia does, while the CIE assumed Australia 'goes it alone', so the modelling really has highlighted the likely outcome if Australia implements a policy in advance of our competitors. But, as a business responsible for running four cattle properties, let me tell you that I don't like the ABARE numbers any more than I like the CIE numbers.

The other thing that needs to be recognised is that the CPRS will impose big costs in our industry from the day it starts – not just after 2015. Analysis for the red meat processing industry has identified that just for emission permits alone at an emission price of around $25 per tonne CO_2-e, the first year cost for the industry will be $63 million and the point we've made as processors is our overseas customers aren't going to pay this bill. Teys Brothers is doing a lot of business today in Russia with meat traders. We can add a CPRS levy on the bottom of the invoice we send them for our next sale, but I don't think the cheque I eventually get from them will include that extra amount. That becomes another burden on the industry.

The last point that should be made is if we let this turn into a production levy, it will simply cause production to reduce. As the third largest cattle

producer in the country told me very simply the other day, 'The only thing I can do to manage my emission cost if it's in the form of a production levy is produce less cattle.' I don't like that as a processor because that means I get less cattle to process. Processors around this country, and it's the same across the world, run on about a one to 2 per cent margin so if you drop through-put in any of these plants to any great level, we're out of business.

I won't go into those CIE numbers; we saw them up there yesterday. But it shows you some pretty significant impacts. That's not a prediction, that's not to say that's what will happen in 2030; but what it's got to be for us is a bit of a call to arms to say that the industry cannot accept the inevitability that those numbers would mean. Because I know the owners of our business would just look down that page very quickly and say, 'Well we're not there in 2030 if that comes true.' So there's a lot of work for us to do and there's probably a lot of ways we'll need to tackle it.

Where to from here? I think the key message for the agricultural industry is to work together. In the past, governments have been pretty good at picking parts of us off and dealing with one and then dealing with the rest later. I'm sure right now government will say to us if we rush in, 'Oh you're not till 2015, we'll deal with you later.' But in the next breath I hear, 'Why do you want to do something different? We've decided the policy on this aspect.' And I'd say, 'Well hold on we weren't there at the table when you made that decision.' We've got to be sitting at the table. We've got to be there engaging government; but most importantly we've got to bring the industry along with us. Because at the end of the day they're going to make it happen, not us.

My very final point is we've got to remember out there there's a customer and this stuff is already having real big impacts in the markets we deal in. There's well meaning organisations out there at the moment, and maybe some not so well meaning, that are marketing what they claim to be carbon neutral products to our customers. They're saying, 'Well if you're in the food service business, the best way to reduce global warming is to buy less beef and buy less lamb and you're going to reduce the emissions profile of your business.' We're starting to see these things as trade barriers. Whatever else we do, there is a need to be aware that this issue is a growing challenge to our businesses, and it is only going to grow as a challenge in the future.

Thanks very much.

Panel Session: Suzi Kerr & Tom Maguire

Q. Suzi, you made a comment to the effect that the long-term optimal response is to change diets and I'm interested in this from the perspective of global food security issues. I am from the grain sector, and I recognise there are possibly positive opportunities for farmers that could arise from these issues. For example, it could be mandated that livestock should be grain fed rather than grazed on pastures, to the advantage of grain growers. Over the longer term, however, global emissions from agriculture will need to rise if we are to successfully feed a global population which is going to be 50 per cent increased by 2050. Do you consider capping agricultural emissions in any given country, and particularly export driven countries, as an appropriate policy given the potential that such a policy has to exacerbate global hunger?

Suzi: Obviously, the world is going to need a lot more food in the future and that's going to be challenging for all sorts of reasons. My point about changing diets is that there are a number of ways we can respond to this without people needing to eat less food, and presumably at least some people will eat more food than they currently do. But there will need to be an incentive so that, where it's possible, there will be a move in food production away from very greenhouse gas intensive food products like red meat towards a more grain-dependent diet. If people are eating grain rather than eating beef, the emissions associated with the production of that food are considerably lower. I think that has to be part of the solution.

I am from New Zealand, and New Zealanders eat huge amounts of dairy and red meat and we're not going to completely move away from that but we do need to think whether in future quite as much of our diet should come from that source. The response from some of our sheep/beef farmers is there's nothing else that can be grown on much of our land anyway. If there is a policy to discourage ruminant livestock production, the only response available will be reduced food production because it's just not possible to grow grain on these steep New Zealand hillsides. I think those farmers on those steep hilly lands have a point, but where it's dairy land, which could conceivably be used for different forms of food production; there are probably other alternatives.

The other point is, we're not talking about capping agricultural emissions in any country; we're talking about including it in an emissions trading system. That would mean that there's a price on agricultural emissions, but not necessarily a restriction on the total

emissions produced. I would imagine that what will happen – and all our modelling suggests this – is that New Zealand will keep producing more and more food, but there will be a change in the way we do it so that the same products are less greenhouse gas intensive.

Q. Suzi, the New Zealand legislation put the point of obligation at the processor, however I am interested in the views of the different industry groups. I had heard, for example, that Federated Farmers of New Zealand are pushing for a farm-level point of obligation in New Zealand. I would also be interested in whether you are prepared to hazard a guess on where you think the policy settings might end up later this year?

Suzi: Well this will be only my point of view and Dennis Butler who's also involved in this might want to chip in here. I believe the current legislation places the liability for farm emissions with the processors. That doesn't mean that the processor has to go off and monitor all the farmers. What processor-level means is that it is simply a tax on output. In order for the system to operate, all that is required is to work out how much meat or milk is going through the processing works, which presumably is already well known. That approach is attractive to government because it's easily enforceable but it's only a tax. Pretty much everybody else other than the Treasury thinks that if you're going to have an emissions policy then the point of obligation should be at the farm level, but then you run into the problems of compliance and monitoring. I don't think anyone who's in the sector really likes the processor option simply because it is just a tax on output.

Q. Did Dennis Butler want to comment on that?

Dennis: I'd just agree with what Suzi said. You must remember that currently in the New Zealand legislation that was passed last year the processor has been set as the point of obligation but it can be changed relatively easily. With a new Government the law that was passed last year is under review and I don't know what Federated Farmers may have said recently. But certainly within the Committee that was developing the policy last year the virtually unanimous view was that to be effective in reducing emissions from farming activities, the point of obligation really needs to be at the farm level.

Q. A question for Suzi. Can you give us some sense of where other countries are up to with ETS? Last night at our dinner the issue that Australia is too far ahead of the pack was brought up and so I'm just wondering, really what is happening in Europe? What's likely to happen in North America, Canada, South America, particularly from a beef perspective? Have you got information that could give us a bit of a feel for really where things are up to in relation to this issue globally?

Suzi: I think you probably all know the same things that I know. Obviously Europe has a system already operating, Japan is seriously considering one, and the United States is likely to develop a scheme within the next few years. However, none of those schemes involve agriculture. There are no comparable systems operating globally that involve agriculture. In Latin America there are some moves to implement climate change policies, but this may still be some time in the future. I spent a year on sabbatical in

Chile a couple of years ago and that is a country that may start being involved in climate change policies not too far into the future. I have also heard rumours that the developing country block is breaking up a little in the negotiations but it's definitely still at the rumour stage so I think we've got a long way to go before they engage in any serious way.

Q. A question for Suzi. You mentioned the possibility of climate change policies changing consumer behaviour, and leading people to change their diets. The message we have in Australia from retailers is that they will not pass on any costs associated with the CPRS so there is no pass through to the consumer. The inference being therefore that the consumer diet will not change. Has there been any conversation with retailers in New Zealand about that issue and what has been their response?

Suzi: I'm not aware of any response from retailers in New Zealand on this subject. I can't imagine why retailers wouldn't pass on the extra costs if they can, and the big question is 'Can they?' The answer will depend on how much international competition they face for equivalent products. To answer your question, though, I'm not aware of a discussion on that in New Zealand.

Q. Suzi you mentioned that, as is the case in Australia, New Zealand is very much focused on the Kyoto rules and therefore mitigation actions on-farm are very constrained. As I understand it, there is some potential for de-nitrification or nitrification inhibitors as a potential emission-reduction option, but beyond that it looked like the cupboard is pretty bare given the Kyoto rules. Would you like to expand on that a little bit more?

Suzi: Obviously to be able to recognise mitigation or sequestration in a national inventory there is a need for very strong science, science that is peer-reviewed and accepted. It is not clear to me that the Kyoto rules are as much of a constraint as you might initially think because you wouldn't really want something to be in the New Zealand greenhouse inventory if there is uncertainty about it. For example, the feed pads used in the dairy industry are something that are often talked about as potential sources of agricultural emission mitigation, but from the modelling so far, it's not entirely clear whether a feed pad does result in reduced emissions when you include it as part of a whole farm system. So the science really is a long way back on many of these options.

Q. But does it then get to the point where a government might argue, 'Well it's not Kyoto compliant, therefore we're not going to dedicate the science investment to it because it would be a long pathway to try and get it recognised?'

Suzi: No. There is a lot of research going on into different mitigation options, including biochar, which you're also looking at in Australia with a very long-term view. If we're going to respond to this we do need some more mitigation options and I don't think that's holding us up. In addition, I haven't heard any suggestion that the UN are being unreasonable in their requirements, I think they're requiring a level of scientific certainty that may be slightly higher than we would want but that hasn't been identified as a major constraint to increasing mitigation options thus far.

The Voluntary Soil Carbon Market in the USA. Is this a Viable Model for Australia?

David Miller

Director of Research and Commodity Services for the Iowa Farm Bureau Federation and Chief Science Officer for AgraGate Climate Credits Corporation

David Miller, Director of Research and Commodity Services for the Iowa Farm Bureau Federation and Chief Science Officer for AgraGate Climate Credits Corporation. David has been a key player in helping to establish the rules of the Chicago Climate Exchange on carbon offsets. He is active in agriculture production, operating a 400-acre grain farm in southern Iowa and has served as a commodity policy specialist for the American Farm Bureau.

Good afternoon. I very much appreciate the opportunity to be a part of this program. It has been very enlightening and interesting to listen to the discussions and the range of topics that are part of the debate here in Australia relative to agriculture and greenhouse gases.

My task today is to give you an overview of what's going on with regard to agriculture and carbon markets in the United States. And particularly whether or not, the approach that we've been using in the United States, which involves engagement in voluntary markets, might have any viability or applicability to what's going on in Australia.

I will first briefly provide you with some background to myself and my roles, as I do wear two hats. I am the Director of Research for the Iowa Farm Bureau Federation. It is a membership-based organisation. We have about a 155,000 families that are members in Iowa, and are part of the American Farm Bureau Federation. The United States farm organisations have very close to five and a half million members, not all of which are active farmers. There are members who are rural residents, and also what we call Ag-supporting members who have a lot of interest in the common issues of agriculture and are part of the Federation.

The Iowa Farm Bureau began to get involved in carbon policy nearly 13 years ago, when we started looking at the whole concept of environmental credit trading and water quality incentives for farmers. Some of this stemmed out of the Sulphur emission reduction trading scheme, that was part of our 1990 Clean Air Act. As a policy analyst for the Farm Bureau, I became involved in looking at what was developing in this realm. We sat back and watched and analysed until about 2001 or 2002, when we became engaged with what was later to become the Chicago Climate Exchange. I liked the concept that the Exchange was developing that involved tradable credits, and saw opportunities in that for agriculture. The Iowa Farm Bureau became involved and our Board said we would be much more effective being inside the system helping to design it and work with it and understand it from inside; rather than being on the outside throwing stones at it without a clear understanding. Based on that philosophy, our Board authorised the Bureau to become the first aggregator within the Chicago Climate Exchange system.

We started out just providing a carbon aggregation service to members within the State of Iowa. Very quickly we were approached by sister organisations in other states and the next thing you knew I was

spending a lot of time explaining why Iowa Farm Bureau was operating in Texas and Mississippi and various other states; so we decided to launch a new organisation called Aggregate Climate Credits. This is a wholly owned subsidiary of the Iowa Farm Bureau, but designed to be involved in the aggregation of carbon credits from agriculture on a national scale.

We dub ourselves the Country Elevator of Carbon Credits. We see our role as aggregating farm carbon credits into marketable parcels, helping farmers at any level to access the carbon market and helping them facilitate the movement of their commodity, called a carbon credit, into the trading system.

We offer a set of services. Information is probably the number one service that we provide, helping to educate farmers about this new market. There is so much misinformation, lack of information, lack of understanding in the agricultural community on carbon, and that understanding is no less than the lack of understanding in every other sector. In fact, I would go so far as to say there is a total lack of understanding of carbon policy in every sector. Everyone is struggling with this and there is tremendous opportunities and needs for information, education and outreach.

We spend a lot of time doing that. Unfortunately, that does not generate any revenue and so we had to consider how best to generate the revenue needed to support some of those types of activities. In saying that, however, our primary role as AgraGate is actually to do enough education so that farmers understand whether or not there are opportunities for them to participate in the carbon market. Understanding what is involved is the first step in the process for farmers who need to make decisions about whether to go through enrolment, certification, verification and ultimately credit marketing.

The Chicago Climate Exchange trading model is not a regulatory model. There really are two models for trading systems in the world. One is the model under which the Chicago Climate Exchange operates. It's a rules based trading model where people who voluntarily participate agree to be bound by the rules of the trading system. It is the system on which the New York Stock Exchange, the NASDAQ, the Chicago Board of Trade, and the Mercantile Exchange all operate under. These are all rules based exchanges, managed under the rules written by the trading members who represent both the buy and sell sides of the market, so that neither side is advantaged or disadvantaged within the trading rules. There are some real strength to a rules-based trading system, under which the members come to the table to write the rules they all agree to abide by.

The other framework for trading systems is a regulation-based trading system or government mandated trading system, where it is the threat of regulation and in many cases, criminal or civil litigation becomes the compliance driver, rather than contracts and the law supporting those contracts. The Kyoto Protocol, and its associated laws are the basis for international carbon markets such as the European Union's ETS, and they come with all the baggage associated with what is an agreement based on science but compromised by politics. I would suggest that not everyone is necessarily equally represented in drawing up the rules of such a system. That is one of the flaws that you all – based on the conversations I have had here over the last few days – are struggling with mightily. It is a fundamental weakness of a mandatory trading system, and is an issue that the Kyoto Protocol system is going to have to deal with.

In contrast to that, the market US farmers operate in is one where being inside the system, you helped write the rules. I think we've been very effective at helping to look at how those rules can operate from an agricultural perspective by being inside that system.

That is all very well and good I hear some of you say, but the Chicago Climate Exchange is just a voluntary trading system. That is correct, but it is important that you understand the only 'voluntary' part of the market is the decision to participate. Once you become a participant, you are bound by legal obligations under the rules of contract law that apply to any rules based trading system. Most, in fact probably 90 per cent of the world's commerce works under those same rules, with the same

imperatives associated with entry into any legally-binding contract. Why should the carbon market be any different?

It may be that in fact in Australia a voluntary system is a little bit of a non-starter, given the imminent establishment of a mandatory market. However, as offset providers, I don't see US farmers facing very different rules whether we're part of voluntary participation in a regulatory compliance system; which is where agriculture in the US is likely to end up, or being an offset provider into a voluntary carbon market that requires contractual certainty and veracity if the market is going to work.

Let me just explain in a little more detail how the Chicago Climate Exchange voluntary carbon market operates. The demand side, if you like, is created by emitting members, who collectively took on an obligation to reduce their emissions by 6 per cent by 2010 from a 2000 base line. Between now and 2010 this will be the most aggressive emission reduction scheme anywhere in the world. After 2010 there are likely to be more aggressive ones in some of the Kyoto based systems and the schemes that are there.

I think there is something to be learned from that system which is actively doing more than any other system in the world to reduce greenhouse gases. AgraGate operates an offset program within that scheme. To directly participate in the market you have to be a member of the CCX, and if a business creates more than 10,000 metric tonnes of CO_2 emissions per year as an entity, it must become a member in order to get credit for any reductions. If your annual emissions are less than the 10,000 tonnes threshold, then you are not able to be involved in the system unless you go through an aggregator.

This is relevant to your discussions here, the concept of a minimum threshold of emissions for participants. I have heard a lot of discussion over the last few days about whether agriculture should be in or out of the Australian system, but I have not heard much debate about thresholds for participation. As I observe Australian agriculture, it can be a covered sector, but if the 25,000 tonne reporting level is applied at the firm level, 98 per cent of Australian agricultural businesses would not be covered entities. You may be a business that operates in a covered sector, but you may not be a covered entity, because you don't have any reporting obligations if your business produces less than 25,000 tonnes.

In the US very recently, legislators put together some rules for a proposed mandatory scheme, and the strong sense is that the regulatory threshold in the US scheme will also be 25,000 tonnes of CO_2-e emissions. From the perspective of US agriculture, there will probably be 100 poultry facilities, 40 pork facilities and 30 beef feedlots that will be covered under that rule. It should be noted that the US is not including enteric emissions within our scheme, but even if it included enteric emissions it probably wouldn't pick up another 1,000 agricultural entities nation-wide, based on the 25,000 tonne threshold.

That is why I think you're having the wrong debate here. You're debating how agriculture should operate as a covered sector, assuming at the farm level that all farm businesses will be covered entities. However, I've seen no evidence that anybody wants to regulate down to the 100 tonne CO_2-e level, which is the level that would apply to a lot of farm businesses. In the US, 85 per cent of national emissions are covered by including 30,000 entities in the scheme, which is the situation with a 25,000 tonne CO_2-e threshold level. If the US applies a 10,000 tonne threshold, 87 per cent of national emissions are covered, and the scheme will have 1.3 million reporting entities. If the US scheme has a threshold less than that, the number of participants starts to increase exponentially. The Government has made it very clear that there is not a lot of enthusiasm to cover 2 per cent more of national emissions, if it means the number of participants will increase from 30,000 to 1.3 million. It clearly makes no sense, and there are other measures available to deal with those emissions, so I see no effort in the US to move us beyond a 25,000 tonne threshold.

I think one of the big issues in Australia right now is the uncertainty that looms over the agriculture sector through to 2013 or 2015. Are farms in or are farms out? That's a huge element of uncertainty,

and it is anathema to creating a viable carbon market.

In terms of the discussion about greenhouse emission accounting, I think that nobody is going to give you a credit because grass exists. On the other hand, I would argue, nobody ought to be giving you a debit because a cow exists. Whatever is done has to be verifiable and I think that is one of the huge issues for agriculture. If the system of accountability and verification of what you do is going beyond self-certification, it will be expensive. The required administrative structures can be cheap if you are willing to run a self-certification system, but if you actually have to carry out a regular audit and run a system that has all of the documentation to back up every claim you make, then it will be a very expensive system and you need to be aware of that. Any system also needs to be fully fungible. I would strongly caution against creating a two-tiered system which would mean some offsets are not able to be marketed to some participants or for some purposes.

In developing the concept of offsets, it is possible to develop a robust system by discounting the extent to which the full amount of sequestration or mitigation is recognised. By setting crediting limits that are a little bit conservative, it is possible to reduce the compliance and administrative costs, and still have a viable functioning system. In conjunction with that, it is possible to establish reserve pools and other things to provide reassurance about the sequestration that has occurred, because there is no such thing as permanence in biological systems. They are ever changing and therefore the whole concept of permanence is ill-suited and not even an appropriate term for biological systems and agriculture. It is also not necessary to achieve the greatest amount of sequestration that is possible in every situation. Having a system that requires enrolment, certification, verification, registration and ultimately the sale of credits creates a number of checks and balances to keep the system honest, but don't forget there's a whole lot of infrastructure that needs to be developed in order to facilitate those five little easy steps.

I make no apology in saying we in the US are a little bit proud, if you will, of what we've done, with offset protocol development and implementation for no-till, for grasslands, grazing lands, rangeland, afforestation, managed forest, agricultural methane and biomass production. In

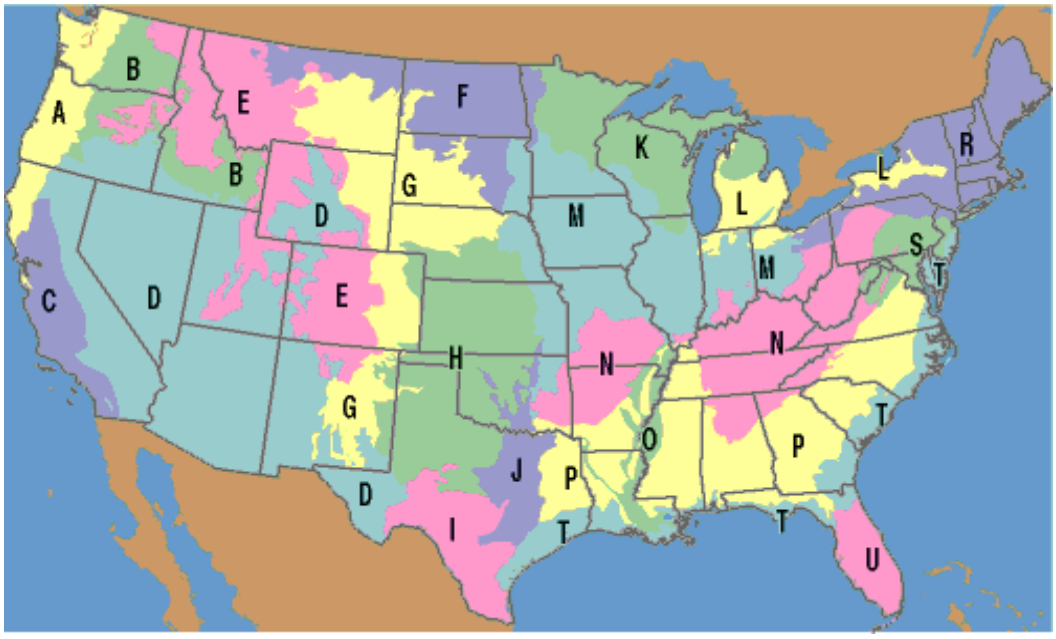


Figure 1: US Land Resource Regions, based on soil types.

every one of these areas, we have developed the infrastructure of the rules etcetera, so that producers could be enrolled, projects verified, credits traded and producers paid. That is significant amount of development that has occurred in about five years, but having said that we are not perfect, and we are still looking to improve upon the protocols.

There are two major aggregators that have emerged for the rural sector, and these are two state affiliates of the major farm organisations. These are the Iowa Farm Bureau in the case of the Farm Bureau System and the North Dakota Farmers Union with regards to the farmer's union associations. Between the two of us, there are 9,000 to 10,000 producers participating in the program in about 35 states, although there are not projects in every state at this stage. There are about four million acres of no-till cropping areas enrolled in the system, which is about one and a half percent of the productive agricultural land in the USA. There is about a million acres of perennial pasture establishment, which is probably about two percent of the area in the USA, and three million acres of rangeland, which is about one percent of US rangelands enrolled in the program, as well as five hundred thousand acres of afforestation and a couple of million acres of managed forest. While these numbers are a good start, the system is only at the beginning stages of a long marathon. It is at the first half-mile marker in a 26 mile race, and there is a long way to go yet.

I think it is very important that whatever farmers do in this realm does need to be real. It needs to have good quantification methodology. It needs to be additional to what would have otherwise occurred. Whatever is done also needs to be able to be verified. The global emission trading rules require verification, so if anybody thinks that a system based on self-certification will be acceptable, they are kidding themselves. The world won't recognise a system such as that, although that doesn't mean that there is a need for a white-coated inspector to visit every farm, every year. There are well-established sampling and statistical processes that can be used, and I'll talk a little bit more about that later.

I would argue for agriculture, rather than using the term 'permanence' there is a need to be talking about 'duration', which is a much more suitable concept to be utilising in association with biological processes. There is also a need to talk about enforceability, which in the US voluntary market arises from the nature of the contracts that are being entered into. It appears that in Australia you are looking at a system that's likely to have regulation as the enforcement mechanism.

There are other hurdles to overcome, and an important one on which there is a need for agreement about is the quantification models that are to be used. My challenge to the scientific community in this regard is to quit quibbling over the fifth decimal point. Commerce doesn't need that level of accuracy, it needs workable, quantifiable systems that are robust. As an example, it is possible to measure grain moisture down to the fifth decimal point, but grain market participants trade on half or quarter points of moisture content. It is critical to approach this from the perspective of how accurate we need to be, not how accurate can we be.

One of the characteristics of the US soil offset system is that we have gone to geographical defined areas and this is a map of what is called the US Land Resource Regions (Figure 1). Our scientists have said these are areas that have similar ecological production and other characteristics that give them some level of unification and homogeneity across those systems. Based on that, a system has been developed that sets crediting rates, but which also recognises that there is no way to measure at the individual farm level with reasonable accuracy what that farm sequestration has been. The systems are extremely costly to do that much soil sampling, however our scientists have said there are years and years and reams and volumes of research reports about soil carbon management that have been produced by researchers at Land-grant Universities and from research plots that are tightly controlled across the US. As a result we have a very good idea of what effect different farm practices have on soil carbon across these eco-regions. If we use this information to calculate average carbon credits, minus some discount or adjustment factor, and as there are large numbers participation it is guaranteed that farmers are actually producing more sequestration than what they say they deliver.

But if I don't discriminate between the farm that's slightly above the average and a farm that's slightly below the average and include all of them, then I would actually suggest that every farm will have acres on it that are above and below the average even within the farm. In fact, when we go to the large scale and have a large percentage of that area participating in the offset scheme, the whole area will perform at a level that is very close to the average. It is interesting that in agriculture we all like to think we're above average. However, by definition not everybody can be above average, and it's extremely cost effective to implement a system that trades on averages in the amount of offsets provided. I would suggest this 'average' approach may not work if you are under regulatory compliance and have to participate, because in that case a lot of farmers will opt to do different things, and should be able to obtain credit or emission relief for those actions.

In the CCX system we have operating in the USA, there is a whole set of rules that underpin each of the different practices that is recognised as an offset. For a system to work well you do need to define them with a series of rules, but given the limited time, I won't go through all them but there's actually several pages of rules associated with each of these types of practices. We have a similar system in place for the rangeland program that operates in our more arid areas. The system works by defining ecological regions, and allocating average sequestration rates to those under certain practices. Those rates may range from sequestration of a tenth of a tonne of credit per acre per year up to about three-tenths of a tonne per acre per year.

We have been doing this in a carbon market that ranges from $1.00 to $7.00 per tonne, and part of our program design was to set up a system that could test and help build infrastructure in a market that probably was undervalued relative to a regulatory compliance market. It is not possible to put regulatory compliance requirements on a system that is non-regulatory on the emitters. The voluntary side of our market is the emitters of the buyer side and therefore our price is quite modest – around $1.40, $1.50 a tonne. If a mandatory system is developed which has compulsory participation for major emitters, I believe the market for agricultural offsets will go to $10–$15 a tonne. In such a market, it would be expected that the current offset protocols would get a little tougher for participating farmers. These protocols can be adjusted appropriately as the market emerges, but we designed the initial system appropriately for a $1 to $2 per credit market. I can tell you that at present, the administration of the system costs about $3 per credit. As an organisation, we're losing money doing what we're doing, but we're doing it because of our interest in developing and demonstrating sensible policy options on this issue.

There are a number of markets for carbon emerging in the USA. The Chicago Climate Exchange is a voluntary compliance market. There are some regional efforts that are underway, including the RGGI (Regional Greenhouse Gas Initiative), but it has no reduction requirements for emitters until 2012. Carbon offsets in that market trade at around $3, because there's no real reduction requirement, so no strong demand for offsets at this stage. The US EPA has also introduced greenhouse emission reporting rules, which are probably the precursor framework of a future US emission trading system. Interestingly, the EPA is using a 25,000 tonne reporting threshold for that system, which is the same as the threshold proposed under the Australian scheme. This means that emissions associated with the manufacture of farm inputs like fuel and fertiliser are all going to be reported upstream.

There are probably less than 2 per cent of the farms in the US that will exceed the 25,000 direct emission threshold, so that possibly means that only about 2 per cent of agriculture will face an emissions cap. The US authorities appear to have made the decision not to include enteric emissions in reporting requirements because, based on the 25,000 tonne threshold only about four cattle ranches in the US that would be brought into the system. The EPA probably determined that it was not an economically fair thing to impose on just four ranches, whose owners could probably just subdivide and take themselves out of the scheme, simply by redefining their entities.

What lies ahead for the US carbon market? In my assessment, there are four main camps, politically. Probably the lead one is supporters of a cap-and-

trade system with a very significant offset program to help keep some control over the cost of the system. If I had to put a rating on it, I would say there is probably a 60–65 per cent probability that this is the policy that will be adopted. Next are the supporters of a cap and trade scheme with limited offsets. There are a lot of criticisms being aimed at agriculture and forestry offsets and whether or not they ought to be included, or whether or not there ought to be a separate program set up for theses offsets and emissions. I think it is fair to say this group has a strong involvement by environmental groups. The next group includes supporters of a carbon tax who want certainty in terms of economic impacts and are comfortable with uncertainty on emission reduction. Finally, there is a segment of society that's supportive of just maintaining a voluntary market, which would likely lead to the development of the three regional greenhouse emission markets.

The key issues are the potential impact on the economy, the level of compromise that will be required politically, and how the US wants to be positioned for the UNFCCC Copenhagen conference. Our President, President Obama, has made it very clear that he wants to have a leadership role for the US at Copenhagen but he does not feel he can do that without having legislation already implemented in the US. He's pushing hard for something to occur, but the political processes are just as they are here, political processes.

In conclusion, the US voluntary market has allowed agriculture and forestry to learn by doing and it's not perfect, but it can be improved. We know a lot more than we did five years ago by having been involved in the process and being part of the process.

If I could use an analogy, agriculture and forestry offsets are the oil that will help things work more easily, but agriculture is not the fuel, nor the engine. Because agriculture has been involved early, we know what we can do, and we have technologies and systems available today. US Agriculture is not betting the farm on what technologies may come down the line, but we are the oil that helps to get the motor running, especially from a cold start. As carbon markets mature, I am sure that the role of agriculture will change, and I am also sure there really will be more opportunities to emerge for agriculture and forestry.

I thank you very much for the opportunity to be here.

Panel Session: David Miller & farmer representatives

Q. David you're telling us we're not asking the right questions. Give us an idea of what are the right questions that we need to be asking from a farm point of view?

David: I think that the term 'covered sector' is being interpreted to imply that every business in the sector will have an obligation under an emissions trading scheme; but the fundamental question for individual farms is, 'are you a covered entity?' Irrespective of whether the sector is covered the critical question for a farmer remains, 'are you a covered entity?' If you are not a covered entity you are in a significantly different situation than if you are a covered entity. I note some of the discussion about point-of-obligation, which appears to me to be an attempt to bring in non-covered sectors and non-covered emissions by aggregating them at the abattoir or the milling plant. That is not a proposal that is being considered in the USA.

Q. If you are a grain grower in the US and a cap and trade system is implemented, regardless of your point about thresholds you're going to get increased costs. My question is, under US proposals are grain growers going to get free permits to compensate for those increased costs? This is important because the 'covered sector' question is really only half the debate. Irrespective of coverage, the more immediate issue for farmers will be the increase they face in input costs. Is there any discussion in the US about this aspect of an emissions trading scheme?

David: Electricity generation will be a covered sector if we have a cap and trade in the US, without question. There is a big debate, though, whether liquid fuel sources are better dealt with directly in a cap and trade scheme, or via a separate set of measures. If you are serious about covering emissions from liquid fuel, it is much more efficient to do so at the point of bulk distribution, not at the consumer. That approach has limitations, of course, because the only message I receive as a consumer is to reduce fuel use, and therefore it is all an indirect effect at the consumption level and any incentives to reduce emissions are purely economic and not environmentally motivated. In the USA there is no talk of giving allocations or permits etcetera to cover that expense for the indirectly affected sectors. I hear no discussion of that whatsoever.

Q. David, a question, what's the reason why enteric fermentation wasn't included in the inventory for the States?

David: The enteric emissions issue within the United States revolves around the makeup of our both beef and dairy industries. The average beef herd in the United States is 22 cows. That's average. Yes we have 11,000; 15,000; 20,000 head herds but the average herd is 22 cows. It's a dispersed industry and so at the 25,000 tonne regulatory threshold level enteric emissions are totally leakable. A farmer can always restructure their business so that they are under 25,000 tonnes just by splitting it up into multiple

business entities. They may still operate it as one entity but it will be split into multiple entities for reporting purposes and create new entities, unless there is a rule that tries to manage around that. Even if you did that and managed to bring those entities into the emissions trading scheme, there are probably less than 100 entities in the United States.

The question facing regulators is why would you set up a system where you require one per cent of that industry to participate. Feedlot and intensive livestock manure emissions are likely to be included in the scheme because those facilities are virtually point-sources of emissions, in contrast to the diverse distribution of grazing cattle herds across the nation.

Q. The issue that David's been raising about the 25,000 tonnes is one which is perhaps needs a bit of comment. So can we please go to Anthea Harris, from the Department of Climate Change?

Anthea: Thank you. Just a point of clarification from the Australian point of view, as I've said many times, the Government hasn't made any decision to actually include agriculture emissions yet, it's a decision to be made in 2013. As part of that decision of course you'd have to look at participation thresholds, and what threshold might be set would come down to the cost-effectiveness of different options. There is no guarantee that the threshold for all sectors would be the same, and in fact the waste sector already has some variation in the threshold compared to other covered sectors.

Q. I just had a question for David, you mentioned that you've got a rangelands offset program, I was just wondering if you could explain a little bit more about that?

David: The range land offset program is designed to categorise and quantify the net sequestration affect of increasing the vegetative index and the quality of the rangeland vegetation through grazing management. It is one where the credit is purely that which is accrued by increasing soil carbon sequestration through improved vegetative management and through animal management. It was based upon establishing a baseline of the general vegetative state of the ranch. The farm manager then has a range of different options, including seasonal grazing and flock or herd movement that can be used to improve overall levels of vegetation. A key issue is drought management. The number one reason for reduced vegetation cover or carbon storage in the western range soils of the United States is overgrazing during drought periods. Part of developing a rangeland carbon credit 'package' is effective management during dry periods. To a large degree it's moving from what I call a very hands off extensive system – turn the cows out on a 1,000 acre paddock and leave them there for a while – to a more intensive management system.

Q. David, I'm just wondering if you could comment on how the profile of a country's emissions might drive differences in emissions trading or carbon trading schemes between nations. For example, in the US your agricultural emissions are something like 6 per cent of your national emission, where in Australia they're something like 16 per cent and for New Zealand they're almost 50 per cent. How would that influence how a nation should design its own ETS given that we've got different national profiles for emissions associated with agriculture and particularly methane from livestock?

David: That is a very good question and it does point out some of the problems associated with trying to operate with one broad-based set of rules under which every industry is supposed to operate. One of the problems is not all carbon sources are equal from a social benefit perspective, and I say that because despite my love for the series Star Trek I haven't seen anybody coming up with a patent for a food replicator. We may be able to build windmills, we may be able to use hydro-electric power, we may be able to find a lot of substitutes for fossil energy, but I haven't seen any replacement for food. Unfortunately, that is left out of the carbon debate to a large degree.

Not only that, but it seems to me that the control points for emissions in agriculture are being placed on developed countries which are all to a large degree net exporting nations. Farmers in these nations are providing food for the rest of the world, including for poor people in developing nations, and it seems that such policies put a horrible social tax on the undeveloped world where people spend 60 to 70 per cent of their income on food. The people in these countries are not buying gasoline, they're buying food. Yet these policies will raise the price of food worldwide, and I wonder whether that is really the intent of policy-makers.

I'm not saying that in developing a global climate change solution that we can ignore agricultural emissions, but I think we have to be very, very smart of how we include them in the broader greenhouse emission policies. If we think about what these policies will do to increase food prices; while food expenditure may go from being 10 per cent of my disposable income to 12 per cent and may mean I go to one less movie a year, for many people in developing nations this price increase is the difference between life and death. If we reduce food production in the major exporting countries we will leak almost every tonne of emissions to the developing world which produces food of a higher carbon intensity in a less productive way. I think it is safe to conclude from this that there is no net environmental affect associated with reducing food production in any developed country.

Q. David you talked about the value to the sector of learning by doing. My question is, should we be doing more learning-by-doing here in Australia? Is that a better way to engage farmers and to get us all into a position where by 2013, we can put some concrete proposals back to the Government on how the sector should be included in the CPRS?

David: From my perspective I think there's a lot of value in learning-by-doing. However, for the sector to learn-by-doing, farmers need some certainty that what they do will not hurt them four years from now; and that it won't change their farm emission baseline to the disadvantage of the farm business just because the farmer took early action. There is a need for some certainty about no-disadvantage applying to early action and just as importantly, this certainty is needed at the entity level. Ninety-eight per cent of farmers could probably start doing something to reduce farm emissions if they had simple certainty, for example, that the entity level threshold for compliance will be 25,000 tonnes.

Concluding Comments

Mick Keogh

Executive Director, Australian Farm Institute

In late 2003, Mick Keogh was appointed Executive Director of the Australian Farm Institute, a newly-established, independent policy research institute established to conduct research into strategic policy issues of importance to Australian farmers. Previous to this, he was General Manager Policy, NSW Farmers' Association. Mick worked for ten years as an agricultural management consultant, for both private and public sector clients; and was a research officer at University of NSW, where he obtained a BSc and MSc in Wool & Pastoral Sciences. Mick grew up on, and continues to be involved in a mixed-farming enterprise based in southern NSW.

Firstly, I want to thank you all for being participants here at this conference. It certainly hasn't been an easy experience and I don't think any of us have come away convinced there's a light shining on the hill and it's all clear and we all know where things are going. Those hoping for a simple answer have probably reached the point where the whole issue seems now to be shrouded in complexity, and there are no easy answers. While frustrating, that feeling should also be regarded as a sign of progress. As Albert Einstein noted, 'I wouldn't give a nickel for the simplicity on this side of complexity, but I would give my life for the simplicity on the other side of complexity.' In other words, we need to fully understand how complex this issue is, before we can really come up with robust solutions.

I think it is fairly obvious that developing some options for mitigation in Australian agriculture, other than growing trees, is going to be absolutely critical. That, of course, requires investment in science, but I think it probably goes beyond that because I think it will very quickly move over to the normal way things happen in agriculture and that is trial and error.

I think the real challenge will be finding ways to have different mitigation systems up and running and able to be trialled without the risk that a farmer run into a major disadvantage in some subsequent policy decision making. So the real challenge will be whether it is possible to find ways and mechanisms to get mitigation schemes up and trialled on a 'no-regrets' basis. I think that with sufficient resources we will make progress on the science required to achieve agricultural emission mitigation, but getting that practical innovation in the field and applying that science and integrating it into farm management systems will be just as big a challenge. My message is that to maximise progress, I think we need both the science, and the application of that science to be occurring almost simultaneously, not the application following long after the initial science, as is normally the case. We really do need some mechanism for that quick application of the science to occur and I don't see that at the moment.

The second thing that keeps coming through is the need for the entire agriculture sector to attain what I might call some common purpose and momentum around this issue. We've heard it expressed in a whole range of different ways and I really do think it's pretty obvious that the sector should have, at the very least, a taskforce that involves the entire sector from the processors right through to the farm level. There should be some agreement around where that's going and some industry-wide direction achieved out of it. Now whether that's within the NFF, or whether it's a consortium of all the various representative groups managed by a body such as the NFF seems inconsequential; what really matters is that the entire sector develops some direction

and momentum, otherwise other sectors will take whatever advantages they can and the agriculture sector will end up worse off.

I believe the third thing that is required is some transparency on the potential impacts of policy proposals. I don't think there's been enough very open discussion about the potential impacts, the sectoral nature of some of those impacts and the sort of things that might flow on from some of those. It almost seems that anyone who suggests that the proposed policies might result in some negative impacts on industry is quickly labelled a skeptic or a denier whose views can be discounted or disregarded. This is a pretty dangerous and short-sighted approach to considering such a major policy change, and one that will come back to bite governments and policy-makers. From an agriculture-sector perspective, I think that this highlights the need to have a really good and robust test-bed of information that can be used to fully analyse any proposals that are put forward to try and identify the best way for the agriculture sector to be engaged in national emission mitigation efforts. It was certainly very evident in the discussion group I was involved in that there is a lot of uncertainty about whether an emissions trading scheme can be made workable for a sector such as agriculture, and what a better alternative might be.

In closing, I want to acknowledge the generous sponsorship of the Climate Change Research Strategy for Primary Industries (CCRSPI), without whose help this conference would not have been possible. CCRSPI is a consortium made up of the Australian Government, state governments, and rural research and development corporations, and is a good example of a collaborative approach to the urgently required research and development investment that the agriculture sector needs in relation to this issue.

Membership of Australian Farm Institute

☐ I would like to support the activities of the Australian Farm Institute by becoming a Member

Entitlements:

Farm Policy Journal subscription, Institute papers, Research reports, Institute newsletter and access to Institute seminars

(Please mark the appropriate category – one only)

- ☐ Individual Membership A$275* annually (Incl. GST)
- ☐ Corporate Membership (Please contact the Institute)
- ☐ Student Membership A$132* annually (Incl. GST)
- ☐ Co-funders and Sponsors (Please contact the Institute)

Subscription to the *Farm Policy Journal*

☐ I would like to Subscribe to the *Farm Policy Journal*

Entitlements:

Four editions of the *Farm Policy Journal* and Institute newsletter

(Please mark the appropriate category – one only)

- ☐ Hard copy A$165* annually, 4 issues (Incl. GST)
- ☐ Electronic copy [PDF] A$132* annually, 4 issues (Incl. GST)
- ☐ Institutional Publication Subscription from A$1,100* annually (Please contact the Institute)
- ☐ Institutional Journal Subscription from A$605* annually (Please contact the Institute)

* Subscription charges and membership fees are subject to change. Please contact the Institute for pricing of International memberships and subscriptions.

Title Mr / Mrs / Ms / Other: _____

Name _____

Position _____

Organisation _____

Address _____

Town/City _____ State _____

Country _____ Postcode _____

Telephone _____ Fax _____

Email _____

Occupation:

☐ Farmer ☐ Student ☐ Agribusiness ☐ Academic ☐ Government ☐ Consultant ☐ Media ☐ R&D ☐ Other

Payment Options:

1. I have transferred the amount of $_____ by EFT to:
Account Name: Australian Farm Institute Limited
BSB: 032 002 Account number: 41 2830
Bank: Westpac, Royal Exchange branch
Please use full name or invoice number (if applicable) as reference

2. Charge my credit card for the amount of $_____ ☐ Visa ☐ Mastercard ☐ Diners Club ☐ American Express

Card No: ____ ____ ____ ____ / ____ ____ ____ ____ / ____ ____ ____ ____ / ____ ____ ____ ____ Expiry Date: ____ / ____

Card Holder's Name: _____ Signature: _____

3. I enclose my cheque for $_____ made payable to Australian Farm Institute Limited ABN 29 107 483 661

Return this order form and payment to:

Mail: Australian Farm Institute Limited, Suite 73, 61 Marlborough Street, Surry Hills NSW 2010 AUSTRALIA
Fax: 61 2 9699 7270
Apply online: www.farminstitute.org.au

Publication Order Form

Research Reports and Conference Proceedings

Members first copy free, additional copies A$44 (Incl. GST); Non-members A$66 (Incl. GST)

- ☐ Essential Services in Urban and Regional Australia – a Quantitative Comparison
- ☐ The Australian Carbon Pollution Reduction Scheme: *An Introduction for Farmers and Agribusiness*
- ☐ Some Impacts on Agriculture of an Australian Emissions Trading Scheme
- ☐ Value in Value Chains: *Collaborative Business Models and Farm Accreditation Systems Examined*
- ☐ Preliminary Modelling of the Farm-Level Impacts of the Australian Greenhouse Emissions Trading Scheme
- ☐ Australia's Emissions Trading Scheme: *Knowledge Gaps and Research Needs for Primary Industries*

Back copies: Members A$44 (Incl. GST); Non-members A$66 (Incl. GST)

- ☐ Estimating the Value of Environmental Services Provided by Australian Farmers
- ☐ Conference Proceedings: *Agriculture, Greenhouse and Emissions Trading Summit 2008*
- ☐ The Implications for Australian Agriculture of Changing Demand for Animal Protein in Asia
- ☐ Developing a Good Regulatory Practice Model for Environmental Regulations Impacting on Farmers
- ☐ Productivity Growth in Australian Agriculture: *Trends, Sources, Performance*
- ☐ Enhancing the Customer Focus of Australian Agriculture
- ☐ Vertical Contracting and Australian Agriculture: *Implications for Farmers and Policy-makers*
- ☐ Agricultural Development in Argentina and Brazil: *Emerging Trends and Implications for Australian Agriculture*
- ☐ Australian Farm Sector Demography: *Analysis of Current Trends and Future Farm Policy Implications*
- ☐ Australia's Farm-Dependent Economy: *Analysis of the Role of Agriculture in the Australian Economy*

Purchase Online

Simply logon to www.farminstitute.org.au using your user name and password to purchase a publication

Discussion Paper

Members A$33 (Incl. GST); Non-members A$55 (Incl. GST)

- ☐ The New Challenge for Australian Agriculture: *How do you Muster a Paddock of Carbon?* (on greenhouse policy and emissions trading)

Farm Policy Journal

Back copies: Members A$27.50 (Incl. GST); Non-members A$44 (Incl. GST)

- ☐ Vol. 6 | No. 4 | 2009 it's easy being labelled, but not easy being green
- ☐ Vol. 6 | No. 3 | 2009 liberalism and protectionism: can you have the cake and eat it too?
- ☐ Vol. 6 | No. 2 | 2009 hype, hope or just hard work? agriculture in northern Australia
- ☐ Vol. 6 | No. 1 | 2009 hunger pains: the challenges of global food security
- ☐ Vol. 5 | No. 4 | 2008 emission impossible? agriculture's role in emissions trading
- ☐ Vol. 5 | No. 3 | 2008 who will mind the farm? tackling the rural skills shortage
- ☐ Vol. 5 | No. 2 | 2008 new kids on the block – emerging agricultural exporters
- ☐ Vol. 5 | No. 1 | 2008 biosecurity policy – safe trade or safety trade-off?
- ☐ Vol. 4 | No. 4 | 2007 animal welfare – consumer fashion or passion?
- ☐ Vol. 4 | No. 3 | 2007 water policy reform – will it perform?
- ☐ Vol. 4 | No. 2 | 2007 biofuels – can agriculture fuel the world?
- ☐ Vol. 4 | No. 1 | 2007 China – emerging opportunity or emerging threat
- ☐ Vol. 3 | No. 4 | 2006 environmental management systems – is there value in the cost?
- ☐ Vol. 3 | No. 3 | 2006 regional development policy – can it work?
- ☐ Vol. 3 | No. 2 | 2006 drought – developing policy before the inevitable dry?
- ☐ Vol. 3 | No. 1 | 2006 agricultural research and development – a private future?
- ☐ Vol. 2 | No. 4 | 2005 salinity and native vegetation – policy solutions required!
- ☐ Vol. 2 | No. 3 | 2005 marketing on-farm environmental services – any buyers?
- ☐ Vol. 2 | No. 2 | 2005 EU agricultural policy – reforming or rebadging?
- ☐ Vol. 2 | No. 1 | 2005 industrial agriculture – farming the food chain
- ☐ Vol. 1 | No. 3 | 2004 climate change – can agriculture take the heat?
- ☐ Vol. 1 | No. 2 | 2004 biotechnology – agriculture's gene revolution
- ☐ Vol. 1 | No. 1 | 2004 the future of farmers and farming

Preferred publication format (tick one or both) ☐ hard copy ☐ PDF

Mr / Mrs / Ms / Other: _____ Name _____

Position _____

Organisation _____

Address _____

Town/City _____ State _____ Postcode _____

Country _____ Email _____

Telephone _____ Fax _____

Occupation: ☐ Farmer ☐ Student ☐ Agribusiness ☐ Academic ☐ Government ☐ Consultant ☐ Media ☐ R&D ☐ Other

Payment options (please select one of the following):

1. I have transferred the amount of $_____ by EFT to:
   Account Name: Australian Farm Institute Limited
   BSB: 032 002 Account number: 41 2830
   Bank: Westpac, Royal Exchange branch
   Please use full name or invoice number (if applicable) as reference

2. Charge my credit card for the amount of $_____ ☐ Visa ☐ Mastercard ☐ Diners Club ☐ American Express
   Card No: ____ ____ ____ ____ / ____ ____ ____ ____ / ____ ____ ____ ____ / ____ ____ ____ ____ Expiry Date: ____ / ____
   Card Holder's Name: _____ Signature: _____

3. I enclose my cheque for $_____ made payable to Australian Farm Institute Limited ABN 29 107 483 661

Return this order form and payment to:

Mail: Australian Farm Institute Limited, Suite 73, 61 Marlborough Street, Surry Hills NSW 2010 AUSTRALIA

Fax: 61 2 9699 7270 **Email:** info@farminstitute.org.au

Other Australian Farm Institute Publications:
Research Reports and Discussion Papers

The Australian Farm Institute publishes research reports and discussion papers arising from the annual research program. These publications aim to identify strategic farm sector issues and promote potential solutions to policy-makers and agribusiness leaders. Research topics are initially formulated at the Institute's annual Agriculture Roundtable Conference, which involves Australian farm and agribusiness leaders, researchers and policy-makers, members of the Institute and guest speakers, as well as members of the Institute's Board, Research Advisory Committee and staff.

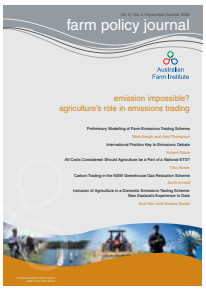
Current Reports, Proceedings and Discussion Papers:

Essential Services in Urban and Regional Australia – a Quantitative Comparison
The Australian Carbon Pollution Reduction Scheme: *An Introduction for Farmers and Agribusiness*
Some Impacts on Agriculture of an Australian Emissions Trading Scheme
Value in Value Chains: *Collaborative Business Models and Farm Accreditation Systems Examined*
Preliminary Modelling of the Farm-Level Impacts of the Australian Greenhouse Emissions Trading Scheme
Australia's Emissions Trading Scheme: *Knowledge Gaps and Research Needs for Primary Industries*

Previous Reports:

Estimating the Value of Environmental Services Provided by Australian Farmers
The New Challenge for Australian Agriculture: *How do you muster a paddock of carbon?*
Conference Proceedings: *Agriculture, Greenhouse and Emissions Trading Summit 2008*
The Implications for Australian Agriculture of Changing Demand for Animal Protein in Asia
Developing a Good Regulatory Practice Model for Environmental Regulations Impacting on Farmers
Productivity Growth in Australian Agriculture: *Trends, Sources, Performance*
Enhancing the Customer Focus of Australian Agriculture
Vertical Contracting and Australian Agriculture: *Implications for farmers and policy-makers*
Agricultural Development in Argentina and Brazil: *Emerging trends and implications for Australian agriculture*
Australian Farm Sector Demography: *Analysis of current trends and future farm policy implications*
Australia's Farm-Dependent Economy: *Analysis of the role of agriculture in the Australian economy*

Quarterly *Farm Policy Journal*



The *Farm Policy Journal* is published quarterly in February, May, August and November. The aim of the Journal is to inform and stimulate debate on contemporary Australian farm policy issues such as regional development, climate change, agricultural research and development, and biofuels. Each edition of the Journal addresses a particular strategic issue and the papers are written by Australian and international experts.

The Institute welcomes submissions of papers on issues pertinent to government policies concerning agriculture and regional communities. Papers must be original and should not have been submitted or published elsewhere. Submissions may be subject to peer review.

Previous Journals:

it's easy being labelled, but not easy being green	Vol. 6 | No. 4 | November Quarter 2009
liberalism and protectionism: can you have the cake and eat it too?	Vol. 6 | No. 3 | August Quarter 2009
hype, hope or just hard work? agriculture in northern Australia	Vol. 6 | No. 2 | May Quarter 2009
hunger pains: the challenges of global food security	Vol. 6 | No. 1 | February Quarter 2009
emission impossible? agriculture's role in emissions trading	Vol. 5 | No. 4 | November Quarter 2008
who will mind the farm? tackling the rural skills shortage	Vol. 5 | No. 3 | August Quarter 2008
new kids on the block – emerging agricultural exporters	Vol. 5 | No. 2 | May Quarter 2008
biosecurity policy – safe trade or safety trade-off?	Vol. 5 | No. 1 | February Quarter 2008
animal welfare – consumer fashion or passion?	Vol. 4 | No. 4 | November Quarter 2007
water policy reform – will it perform?	Vol. 4 | No. 3 | August Quarter 2007
biofuels – can agriculture feed and fuel the world?	Vol. 4 | No. 2 | May Quarter 2007
China – emerging opportunity or emerging threat?	Vol. 4 | No. 1 | February Quarter 2007
environmental management systems – is there value in the cost?	Vol. 3 | No. 4 | November Quarter 2006
regional development policy – can it work?	Vol. 3 | No. 3 | August Quarter 2006
drought – developing policy before the inevitable dry	Vol. 3 | No. 2 | May Quarter 2006
agricultural research & development – a private future?	Vol. 3 | No. 1 | February Quarter 2006
salinity and native vegetation – policy solutions required!	Vol. 2 | No. 4 | November Quarter 2005
marketing on-farm environmental services – any buyers?	Vol. 2 | No. 3 | August Quarter 2005
EU agricultural policy – reforming or rebadging?	Vol. 2 | No. 2 | May Quarter 2005
industrial agriculture – farming the food chain	Vol. 2 | No. 1 | February Quarter 2005
climate change – can agriculture take the heat?	Vol. 1 | No. 3 | November Quarter 2004
biotechnology – agriculture's gene revolution	Vol. 1 | No. 2 | August Quarter 2004
the future of farmers and farming	Vol. 1 | No. 1 | May Quarter 2004

Australian
Farm Institute

New thinking about agriculture

ABN 29 107 483 661

Suite 73, 61 Marlborough Street, Surry Hills NSW 2010

T: 61 2 9690 1388 F: 61 2 9699 7270

E: info@farminstitute.org.au W: www.farminstitute.org.au