The Winston Churchill Memorial Trust of Australia

Report by

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2008 Churchill Fellow

The EC Webb Trust Churchill Fellowship study of dairy industry greenhouse gas emissions and policy development

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Introduction

On my Churchill Fellowship I met with many dairy industry, research and government organisations and discussed topics ranging from emissions trading policy development in New Zealand, emissions research in the Netherlands, emissions policy movements in Brussels, emissions measurement and reporting requirements in California and carbon footprinting and labelling in the United Kingdom.

This report details the discussions and findings of these meetings and subsequent recommendations.

I would like to thank all the people and the organisations I met during my travels – for the time taken and interest shown in providing me the very best understanding of their field of work.

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Australian Dairy Farmers is the national dairy farmer representative organisation whose members are the State dairy industry organisations. These organisations represent dairy farmers across their States.

Thank you

Firstly, I wish to thank the EC Webb Trust in sponsoring my Fellowship and providing me with the wonderful opportunity to explore the international progress of the research and policy directions surrounding dairy industry greenhouse gas emissions. Also for their support of the agriculture sector in recognising the importance of sponsoring scholarships aimed at agricultural investigation.

I would also like to thank the Churchill Trust - from the very first selection interview it has proven to be one of the very best learning experiences one can have. I am very proud to be a Churchill Fellow and I have certainly been spreading the word and encouraging others to take on the challenge of applying for a Fellowship.

Special thanks must go to my project referees Catherine Phelps, Program Manager Natural Resource Management at Dairy Australia and Allan Burgess, past President of Australian Dairy Farmers for their encouragement and support.

Executive Summary

My Churchill Fellowship project - '*The EC Webb Trust Churchill Fellowship study of dairy industry greenhouse gas emissions and policy development'* was sponsored by the EC Webb Trust*.* It was a six week Fellowship which took me to New Zealand, USA, Netherlands, Belgium and the UK during May and June 2009.

The scope of the project was to study international dairy emissions measurement and reporting approaches, mitigation research, policy development, carbon footprinting and product labelling and gain an understanding of the progress and direction by these countries. All with the aim of helping the Australian dairy industry in the management of greenhouse gas emissions in a world becoming more carbon conscious.

The following is a summary of the recommendations outlined in the report:

Two recommendations were made in response to the treatment of agriculture (therefore dairy) under the proposed Australian emissions trading scheme. If agriculture is to be included into the scheme then Australian and New Zealand emissions trading schemes need to be closely aligned to ensure a level playing field, and that one country does not unduly benefit over another.

An alternative recommendation proposed focusing on how agriculture can be effectively managed outside the Australian scheme and still achieve emission reductions. This was supported by proposing that the Australian dairy industry consider developing a paper with targets that demonstrate the industry's work in reducing its environmental impacts along the lines of the UK Milk Roadmap.

Emissions research recommendations included the consideration of the University of California's program of improving cow fertility and the likelihood of better results not just for on-farm productivity - but also for reduced methane and environmental impacts as less replacement stock will be required. *Note: US herd fertility levels are lower than in Australia.*

Under emissions reporting and measurement the US example of over regulation is an important message for Australian dairy farmers. The Australian dairy industry has a good history of working collaboratively with all levels of government resulting in effective industry led initiatives. It is important the industry continues to work proactively and constructively with government to eliminate the need for restrictive levels of government legislation.

Carbon footprinting and labelling recommendation included the proposal the Australian dairy industry keep these areas separate - carbon footprinting analysis does not automatically lead to labelling of dairy products due to issues in the accuracy of measuring on-farm emissions.

Since my return I have been communicating my findings across the dairy industry, as this is one of the most important aspects of the Fellowship. My position as Policy Manager at Australian Dairy Farmers has enabled me to do this through the extensive dairy industry networks.

Fellowship Program

3 May to 7 May 2009 – New Zealand

- Federated Farmers of New Zealand, Wellington - Jacob Haronga, Senior Policy Advisor – agricultural emissions trading policy development
- New Zealand Parliamentary Select Committee Review, Wellington - submission hearings on NZ Emissions Trading Scheme
- NZ ETS submission hearings de-briefing with Federated Farmers of NZ, Fonterra, PGgRC, Deer industry NZ, DairyNZ
- DairyNZ and Pastoral Greenhouse Gas Research Consortium, Wellington - Mark Aspin, Consortium Manager – dairy emissions measurement research and update on Palmerston North farm research station

8 May to 21 May 2009 – California USA

- University of California, Davis - Frank Mitloehner, Assoc Professor and Air Quality Extension Specialist - dairy emissions research
- California Dairy Quality Assurance Program – dairy emissions measuring and reporting
- Western United Dairymen, Modesto - Paul Martin, Environmental Services Director – dairy emissions reporting and policy development
- Dairy farm visits, San Joaquin Valley – Tessa Curti and Jake Oosterman, Western United Dairymen Field Representatives – dairy farm emissions reporting and measuring

22 May to 28 May 2009 – Netherlands and Belgium

- Wageningen University, Lelystad - dairy emissions research
- Wageningen University, Animal Sciences Group, Waiboerhoeve Dairy Research Centre – Jan Bloemert, Farm Manager – dairy research farm
- European Commission Directorate-General for Agriculture and Rural Development, Brussels Belgium – Joao Almeida da Silva, Administrator and Myriam Driessen – European dairy emission policy development
- European Commission Environment Directorate-General, Brussels Belgium –Zoltan Rakonczay, Policy Officer and Jana Polakova - European dairy emission policy development
- European Dairy Association, Brussels Belgium – Joop Kleibeuker, Secretary General – European dairy emission policy development

29 May to 12 June 2009 – London, UK

- Carbon Trust, London – Robin Dickinson, Senior International Projects Manager – dairy carbon footprint measurement and product labelling
- DairyUK, London – Fergus McRenyolds, Environment Manager – UK dairy emissions policy development
- Tesco Stores, Cheshunt, Hertfordshire - Emma Rutter, Agricultural Manager Dairy – dairy carbon footprint measurement and product labelling
- National Farmers Union, Stoneleigh, Warwickshire – Hayley Campbell-Gibbons, Chief Dairy Advisor and Ceris Jones, Climate Change Adviser – UK agricultural emission policy development

Emissions trading policy

New Zealand - New Zealand Farmers Federation

My Churchill Scholarship commenced in Wellington New Zealand (NZ). Both Australia and NZ are moving towards the implementation of a 'cap and trade' emissions trading scheme (ETS) and are the only countries, worldwide, that have considered including agriculture into their emission schemes.

The NZ scheme has a notable difference as they had made the decision to include the agriculture sector into their scheme by 2013. This differs from Australia where our government has delayed the decision of agricultural inclusion until 2013. In the Government Green Paper of July 2008 it stated that, ' While the Government is disposed to eventually include agriculture, it recognises that considerable consultation and joint effort with the industry are still required to indentify practical methods for inclusion, and to develop reliable and cost-effective methods of emissions estimation and reporting.' [1]

The Australian dairy industry has been actively working across the dairy supply chain in analysing all government, coalition and independent party movements in this area. Numerous submissions on the industries position have been developed in response to Senate and House of Representative inquiries.

Therefore my purpose for including NZ into my Churchill Fellowship was to be updated on what was occurring with the development of their emissions trading scheme and to discuss NZ policy direction and changes that are taking place. There has been some level of agreed harmonisation between the two countries governments regarding the alignment of schemes. The Australian dairy industry is concerned as our analysis indicates that the NZ scheme will actually favour their industry compared to what our scheme is likely to inflict on Australian dairy farmers and milk processors.

With the change of government in NZ there came the election promise of reviewing the previous governments scheme. The NZ Select Committee is now reviewing the ETS with the expectation that the revised ETS will be launched in 2010.

The NZ Select Committee system enables members of Parliament to examine issues in more detail than is possible in the House of Representatives. It also enables the public to have direct input into parliamentary process.[2]

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[1] Australian Government, Carbon Pollution Reduction Scheme Green Paper, July 2008, Canberra, ACT
[2] New Zealand Parliament: Select Committees, April 2006, Wellington, New Zealand

My first meeting was with the Federated Farmers of New Zealand (FFNZ) and I was fortunate to be included in their group in attending the Parliamentary Select Committee hearings in the first week of May 2009. It was an excellent opportunity to hear a large number of major agriculture and related industries present to the Committee on their industry submissions.

The FFNZ was represented by Don Nicholson, President; Frank Bremhul, Vice President; and Jacob Haronga, Senior Policy Adviser. Presentations from major NZ agricultural organisations included; FFNZ, Fonterra, Deer industry NZ, DairyNZ, Meat & Wool, Meat Industry Assoc, NZ fertiliser Manufacturers Research Assoc, Horticulture NZ, Pastoral Greenhouse Gas Research Consortium (PGgRC), Balance Agri-Nutrients Ltd, Westland Milk Products.

FFNZ has 26,000 farmer members, representing a large percentage of NZ farmers. Their messages on how the ETS will affect the NZ agriculture sector and the NZ economy follow;

- NZ GDP likely to be reduced by NZ$900 million under the proposed ETS
- Production decline by 13% for dairy industry
- Significant impacts across agriculture
- NZ efficient food producers and produce 1% of world food but only .1% of world emissions
- FFNZ calling for a less costly approach to the ETS but preferring exclusion of agriculture sector or scheme to be totally scrapped

The overall message from the FFNZ is the call for the NZ ETS to be scrapped or amended with the exclusion of agriculture.

While in the hearings there was an interruption to announce a statement from the Australian Government delaying the ETS commencement from 2010 to 2011, citing the affects of the global financial crisis on Australians and our economy. This welcome announcement gave the NZ presenting parties further leverage to call for a similar alignment with this decision.

Both countries are watching each other's scheme developments closely.

California - Western United Dairymen

During my trip to California I organised to meet with Paul Martin, Environmental Services Director with the Western United Dairymen, which is a voluntary membership organisation based in the heart of the San Joaquin Valley at Modesto. This organisation represents more than 60% of the milk produced in California and offers membership benefits in the area of resources in environmental regulations, labour law and milk pricing issues. The members decide on the direction of State and Federal legislative efforts affecting the dairy industry.[3]

[3] Western United Dairymen website, 29 July 2009; http://westernuniteddairymen.com

California is the leading dairy state in the US, producing 21% of the nation's milk supply and the state's highest concentration of dairies is in the San Joaquin Valley. Volatile organic compounds and greenhouse gas emissions from these dairies contribute to regional air quality challenges and the region is currently over the federal limits for ozone and particulate matter in the air.[4]

Paul advised that the US dairy industry has been pushing to stay out of a 'cap and trade' ETS scheme and participation should be only through providing offsets (carbon capture eg soil sequestration, no-till cropping). He said that emissions from agriculture and forestry are only 6% of the national inventory and out of this the national dairy emissions are only 2.3%, also that the protocols and standards of this scheme should be managed by the Department of Agriculture not by the Environmental Protection Agency (EPA).

A National Task Force of environmentalists and agricultural representatives have developed a set of draft principles for a climate change program at the Federal level. The principles outline agricultures exclusion from a 'cap' and provide offsets. Paul explained that he has been on this Task Force for three years. Another agricultural representative is a Congressmen's chief adviser, who is also a lawyer and a member of the California Air Resources Board.

He advised that many areas are still under discussion such as recognising early adopters for prior work on-farm for which they should qualify as an offset (not for compensation). The Western United Dairymen have asked the Department of Agriculture to actively work on this area. So far the Government has been very slow to progress the draft principles through.

Every year for the past three years the Western United Dairymen have put forward a recommendation to the Task Force stating that the sampling procedure for particulate matter testing is over estimating the actual figure and is inaccurate. Paul explained that in most cases data is taken on the number of cows on-farm but for a silage mound the emissions figures are taken on the surface area of the silage mound, therefore conflicting measurement and reporting methods. Research is being conducted by Frank Mitloehner from the University of California to test the accuracy of these methods of data measurement.

Paul advised that the National Academy of Science currently reports on air quality for the EPA at the Federal level. They use a 'model farm' approach for estimating emissions measurement off the land but this type of measurement is inherently inaccurate as location, size and stocking rate of the corrals vary.

When queried about expelled methane from cows, Paul said that the US has shied away from enteric fermentation (methane from cow's stomach) measurement as this is even harder to

[4] University of California, California Agriculture, April- June 2009, Vol 63 No 2, Oakland, California

accurately measure. Therefore their dairy industry is not under the same level of pressure as the Australian dairy industry because this type of emission is being considered for reporting by our Government.

USA emission trading scheme progression

Just to show how quickly things can move, on the day I flew out of the USA onto the Netherlands, the US House of Representatives passed the H.R. 2454 American Clean Energy and Security Act 2009 (US climate change bill) passed through the US House of Representatives (21 May 2009). This Bill outlines the implementation of the US ETS referred to previously.

The significance of this Bill cannot be underestimated as the whole world is now watching the US closely. The Bill is of particular significance to agriculture as it has (as Paul Martin advised) specifically exempted agriculture from the definition of a capped sector and therefore any inclusion into a future ETS. Under the Bill, agriculture will play a role in providing carbon offsets by allowing farmers to claim achievements in reducing carbon pollution by increasing soil carbon or taking other environmental actions.

The big difference here is that the US has not signed the Kyoto Protocol which Australia did in December 2007, and under these requirements Australian agriculture is limited as the only recognised offset provision is long term tree planting.

Also as Paul Martin previously stated, the US Department of Agriculture will run the program not the EPA as the agriculture community objected to the EPA playing a role.

Even though the US Bill is yet to progress through the Senate it has already had a major effect on the progress of the Australian scheme and the Australian dairy industry is watching this progress with great interest.

In July 2009 the Australian Opposition released nine recommendations for changing the proposed ETS before it was due to go back to the Senate in August. They stated that the scheme was flawed and it had to be improved to save jobs, protect small business and industry in Australia and prevent production and carbon leakage (business going offshore). They stated that if the Government ignored these recommendations then they will vote against it. They have followed the US example and are calling for the exclusion of agriculture from the scheme.

Brussels - European Commission Directorate-General for Agriculture and Rural Development

A day trip by train from Amsterdam to Brussels was included into my meeting schedule. For this part of my study tour I received very helpful assistance from Dairy Australia's two Brussels based consultants, Bruce Ross and Trevor Smith. They had organised a number of meetings with the European Commission (EC) Directorate-General for Environment, EC Directorate-General for Agriculture and Rural Development and the European Dairy Association.

The purpose of including the EC into my trip was to gain an understanding of whether there were any policy considerations of including agricultural emissions into the European emissions trading scheme.

The first meeting was with Joao Almeida da Silva, Administrator and Myriam Driessen from the EC Directorate-General for Agriculture and Rural Development.

They explained that when the EU Common Agriculture Policy (CAP) was developed in the mid 1990s it didn't take into account targeting climate change, but nearly twenty years later there are now climate change measures being taken to help farmers to adapt and to mitigate their emissions. Encouraging farmers to alter their own priorities to incorporate climate change initiatives. In 2008, the CAP agricultural policy was given a 'health check' to ensure that issues such as climate change would be incorporated.

The present CAP provides a basic level of income security to farmers as well as a framework for sustainable management of the natural environment in which agricultural activity takes place.[5]

The Directorate-General Agriculture is now working on what the CAP will be after 2013 with the vision of further adaptation to climate change. They are working within the financial framework and are assessing if the funds available and the measures in place are suitable for the future.

Joao and Myriam explained that it is expected to be clearer after the outcome from United Nations Framework Convention on Climate Change (UNFCCC) meeting in Copenhagen in December 2009. They explained that some countries already have quite ambitious targets but they are now putting on the table that they can go further but the smaller (poorer) countries have to be taken into consideration as they aren't able to set these same ambitious targets.

[5] Commission of the European Communities, *Commission Staff Working Document accompanying the White Paper*, Adapting to climate change: Towards a European framework for action, SEC (2009) 417, Brussels, Belgium

The European Environment Agency reported that EU emissions from agriculture fell by 0.3% in 2007 relative to 2006, at a time when the economy grew by 2.7%. Relative to the 1990 base year levels agricultural emissions fell by 20.2% cited to be linked to the EU's proactive climate change policies kicking in.[6]

The European Union has designated agriculture as a 'non-ETS' sector along with transport and buildings. Currently, emissions reduction targets across all non-ETS sectors is 10% though there is no specific target for agriculture as each country can decide on the effort that it may wish to place on emissions reductions. It was noted that agreement in Copenhagen could result in non-ETS sector targets being reviewed.

There is no movement within the EU to consider agricultures inclusion into the EU ETS at this stage.

Brussels - European Commission (EC) Directorate-General for Environment

At the European Commission (EC) Directorate-General for Environment I met with Zoltan Rakonczay, Policy Officer with Forestry and Climate Change, Agriculture, Forests and Soil and Jana Polakova.

In this meeting the message from the EC Directorate-General Agriculture was echoed, that agriculture is not being contemplated for inclusion into the EU ETS as it was considered not feasible in any serious way.

Zoltan explained that there is currently a study looking at livestock emissions in Europe defining the track of farming systems that includes dairy, but noted that quantifying anything across Europe is difficult as farming systems and climates are so different.

He explained that there is some level of concern about dairy emissions in countries such as France and Ireland. Ireland is concerned that they won't meet their emissions targets without significantly reducing dairy production.

Brussels - European Dairy Association

During my visit to Brussels, I met with Joop Kleibeuker, Secretary-General of the European Dairy Association (EDA). The EDA represents the interests of the European dairy industry towards the European Institutions (eg. European Commission, Parliament, Council of Ministers) as well as to the international bodies (eg. World Trade Organisation).[7]

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[6] *'EU agriculture sector records further drop in GHG emissions'*, European Environment Agency website, http://www.eea.europa.eu/publications/european-community-greenhouse-gas-inventory-2009/

[7] European Dairy Association website; www.euromilk.org

Joop explained that the European dairy industry does acknowledge that it has a large carbon footprint and some of the larger dairy processors fall within the scope of the EU ETS.

In October 2008, the EDA released its commissioned paper, *'A sustainable dairy sector: global, regional and life cycle facts and figures on greenhouse gas emissions'*. The EDA recognised that improving environmental impacts is an important part of sustainable production and the report examined the facts and figures concerning climate impacts in the dairy sector.[8]

Joop said that the industry has made, and is continuing to make, significant steps in reducing these environmental impacts through improvements in energy efficiency, reducing water use and treatment of by-products.

When queried about the issue of food miles in Europe, Joop said that because transport is such a small part of the overall carbon footprint of dairy production the issue was not under consideration. Continuing, if the EU produced and consumed more UHT milk (long-life milk which requires non-refrigerated transport) the transport footprint would be further reduced.

In regards to carbon labelling of dairy products, Joop said that retailers have stepped back from this type of labelling because of the additional costs involved.[9]

United Kingdom - DairyUK

While in London, I met with Fergus McRenyolds, Environment Manager from DairyUK. DairyUK is a political lobbying organisation established in 2004 to represent the whole dairy industry, it also co-ordinates generic dairy promotions and provides business services to the dairy sector. They work in partnership with the Dairy Council which is a science focused body.[10]

We commenced the meeting by discussing the dairy industry's Milk Roadmap. This document was developed in 2007 through a partnership of industry groups representing dairy farmers, milk processing sector, retailers, packaging and Government. Consumers were also involved in the development of this document. The Milk Roadmap was developed to provide direction for the industry on reducing environmental impacts by setting targets for farmers, processors and retailers.

[8] European Dairy Association, *A sustainable dairy sector: global, regional and life cycle facts and figures on greenhouse gas emissions*, October 2008, CE Delft, Delft, Netherlands
[9] Ross Gordon Consultants, EDA meeting notes, Brussels, Belgium, 28 May 2009
[10] DairyUK, *Green and White: The environmental credentials of the dairy industry'* 2008

Fergus commented that Milk Roadmap is an important document for the industry as it demonstrates the action the industry is undertaking about environment impacts and details how they are going about it.

He said an extensive amount of work went into preparing the document and outlined the three groups involved;

- Pre-farm and on-farm group – this group had quite a large work load assessing pre-farm and on-farm impacts.

- Processors and distribution group – Milk processors, manufacturers and distribution network.

- Retail consumer group – retail and consumer organisations fed into this. The major retailers were also involved (Tescos, Sainsburys and Marks and Spencer) plus the British Retail Consortium, a trade association for the retail sector who capture a lot of the smaller retailers rather than the larger ones.

Input from the farming sector included a lifecycle analysis of on-farm carbon footprint. Fergus explained that there is an emphasis on farming emissions but that doesn't mean that is where the most efficient actions can be made. There has been considerable work on enteric fermentation (cow stomach digestion causing methane) with improvement in overall reductions in emissions resulting in increased efficiencies in milk yields. DairyUK is working extensively with DairyCo on developing and proving the science around improved feed efficiency conversion.

Fergus explained that the UK is classified as 'Tier 2' under the Intergovernmental Panel on Climate Change (IPCC), and when asked to reduce enteric fermentation emissions they are effectively being requested to reduce the number of cows.

Targets

The Milk Roadmap short term targets on-farm can be difficult to gauge, unlike the processing sectors move towards energy efficient targets which are easier to measure.

On-farm short to medium targets include encouraging uptake by farmers into environmental stewardship and nutrient planning programs, and there have been targets set for reductions in water usage (5-15% reductions) as well.

Milk Roadmap case studies and progress report

Fergus explained that DairyUK had recently released (end of 2008) a briefing on the Roadmap called the *'Green & White – The environmental credentials of the dairy industry'*. It was produced for policy makers and major industry stakeholders and explains though case studies how the UK dairy industry is working towards the Milk Roadmap targets. It is a handy document to further remind the target audience of the UK dairy industry's good environmental credentials. [11]

At the time of our meeting, Fergus advised that the Milk Roadmap's twelve month progress report was due out shortly. Six months ago the targets were reviewed to ensure they were still challenging and still appropriate. He said that they have always described the Milk Roadmap as not a document with targets, but rather it is a process to make environmental improvements. This report announced that after one year of launching the Milk Roadmap the first indications are that the industry is well on the way towards the first set of milestones in 2010.[12]

UK Climate Change Agreement

In 1999, the Climate Change Agreement was introduced by the UK Government. This additional levy is applied to basic industrial fuels, natural gas, electricity, LPG and coal. It is an incentives reduction commitment on the use of plant materials by adding an additional cost of around 10-15% increase in price. The idea is that an energy intensive industry (of which dairy processing is just one of 52 sectors) who are caught by the European Union ETS also come under the Climate Change Agreement (CCA).

Fergus said there are about 120 dairy industry sites in the UK under the CCA compared to Europe where there are about 15 sites. They are caught in the UK as these sites have combustion installations and have the *capacity* to use over 25Kt – not necessarily if they are using over 25kt of energy. This quite high energy use and it's most likely to be milk powder driers that get caught.

Under the CCA a company enters into an agreement with the UK government committing to energy saving targets set over two years. If these are achieved the company will receive up to an 80% rebate – this is a tax rebate. Fergus stated, this was slightly contrary to how the EU ETS works which is polluter pays principle and the company buys allowances on how much is emitted.

In Phases one and two the allocations are on baseline data and every year the allocation is slightly less. If the company is under, then the allocations can be sold but if over or emitted more pollution – then the company would be required to buy.

[11] DairyUK, *Green and White: The environmental credentials of the dairy industry'* 2008
[12] DairyUK, *The Milk Roadmap: one year down the road'* August 2009

Phase three starts in 2013, companies that are caught by the EU ETS will have to buy increasingly more allowances and by end of this phase will have to buy 30% of their allocations. This will be capped which will reduce every year

UK Carbon Reduction Commitment

In the UK there is a new scheme about to commence called the Carbon Reduction Commitment (CRC), this will be similar to the European ETS, so it will be a cap and trade scheme.

The CRC is company based and is trying to capture companies responsible for larger energy portfolios who may have low energy intensity sites such as retail sites. Hotel chains and property developers will also be caught up.

There are now three carbon trading systems in operation in the UK; CRC, EU ETS and CCA. All three schemes are committed until at least 2017.

Fergus said that the CCA is the real carbon reduction mechanism as long as there is a climate change levy on the industry in the UK, then DairyUK will campaign for the CCA as it has shown savings. The industry alone has saved 40,0000 tonnes of carbon over eight years even through there has been an increase in production – therefore producing more product but producing less carbon.

United Kingdom – National Farmers Union

My last meeting of my Fellowship was to visit the National Farmers Union (NFU) which is based in the lovely countryside of Stoneleigh, Warwickshire. Here I met with Hayley Campbell-Gibbons, Chief Dairy Adviser and Ceris Jones, Climate Change Adviser.

The NFU is the national farmer representative organisation in the United Kingdom and lobbies government on across commodity farming issues.

We commenced our meeting by discussing climate change and emissions reductions in the UK dairy industry. They commented there was a lack of science behind the methodologies for measuring emissions and how the calculations were not sophisticated enough to take into account the credit and debits. The NFU recognises that it is an issue that needs to be addressed and will continue to work proactively on solutions.

The NFU was also involved in the development of the Milk Roadmap and Hayley and Ceris commented the document looks at ways of reducing the overall environmental impact by improving on-farm efficiency and performance. One of the target areas identified for increased efficiency is encouraging dairy farmers to conduct a nutrient management plan which includes efficient use of fertilisers that are high in nitrogen. They said there is pressure from the Government to sign up to exact emissions reduction targets but currently this is measured by actual cow numbers. National herd numbers have reduced over the years and cows have become more efficient in milk production, therefore emissions from dairy farming have dropped. They said that in the long term the industry will grow so the footprint is likely to increase and a better way of measuring is required.

Hayley and Ceris described methane and nitrous oxide emissions as a natural biological process which makes agricultures emissions profile very different from all the other sectors (such as transport). A farmer might have a great season and the weathers okay and everything runs perfectly, and then next year could be a completely different. You only need to have an extreme weather event for your emissions to become haywire.

The NFU is committed to trailing new farming technologies such as feed energy and efficiency conversion which improves on-farm productivity and also reduces emissions. These voluntary approaches demonstrate the benefits that can be achieved.

There is also a lot of interest being shown in anaerobic digesters of dairy effluent and the NFU have a vision that by 2020, 1,000 small scale on-farm anaerobic digester plants will be on-farm. Plus 100 larger waste link plants. Hayley and Ceris explain that this is an ambitious target considering there are only about 20 or 30 currently. But compared to the number Germany has managed they felt that 1,000 is a conservative figure.

They said it was important for farmers to be given options to assess its worth on their farm – it's about providing the right programs and incentives for on-farm innovation.

Recommendations

1. International dairy trade is a very competitive market place and Australia and NZ dairy industries compete for the same export markets. We are the only two countries globally contemplating drawing agriculture into an ETS, and we not only compete against each other but the huge dairy industries of the US and Europe for market share. My study tour certainly cemented the fact that no other country is considering drawing agriculture into a cap and trade scheme.

   A good outcome for both the Australian and NZ dairy industries would be a closely aligned policy position from both countries for a trans-Tasman ETS. Ensuring a level playing field that one country would not unduly benefit over another and still be competitive in the international dairy market place.

2. In light of the fast moving political environment surrounding the proposed ETS, the focus of the Australian dairy industry should move away from trying to work out how agriculture should be brought into the scheme with all its unworkable and negative implications.

   The focus needs to be more positive and effort needs to be placed on how agriculture (and therefore dairy) can be effectively managed outside the scheme and still achieve emissions reductions. In Fonterra's submission to the NZ Select Committee hearings they identified that a market based regulatory regime (emissions intensity per unit of output) was preferred.[13]

   This means the Australian dairy industry should focus on 'emissions reductions per litre of milk' and base it on best farming practice - outside the ETS but supporting emissions reductions.

   The UK's dairy industry Milk Roadmap outlines short, medium and long term emissions reduction targets for dairy farmers, processors and retailers. This across industry document demonstrates what the sectors of the industry are undertaking to reduce emissions and therefore demonstrate the industry's environmental management credentials.

   Recommend the Australian dairy industry consider developing a paper with targets that demonstrate the industry's work in reducing its environmental impacts along the lines of the UK Milk Roadmap.

[13] Fonterra Co-operative Group Limited, Submission to the Emissions Trading Scheme Review Select Committee on the ETS Review, 27 February 2009.

Emissions research

New Zealand - Pastoral Greenhouse Gas Research Consortium

In December 2002, NZ signed on to the Kyoto Protocol agreement, long before Australia signed at the UNFCCC Bali meeting in December 2007. By signing the agreement both countries are now bound by set reduction targets for greenhouse gas emissions to what the countries original emissions were in 1990 or take responsibility for excess emissions.[14]

Although NZ is likely to exceed its emissions target by 2012, recent drought and recalculation of the country's extensive forestry plantations will reduce this figure considerably.

But for a developed country, 48 per cent of NZ emissions are from agriculture; with 32 per cent of this are methane emissions from cattle (predominantly dairy cows). The story is a little different in Australia where agriculture accounts for 16% of our overall emissions.

Therefore NZ has applied considerable effort into agricultural emissions research.

While in NZ I met with Mark Aspin, Consortium Manager with the Pastoral Greenhouse Gas Research Consortium (PGgRc) to discuss the work being carried out.

The PGgRc was formed in 2002 with the initial aim of reducing methane emissions from ruminant animals which is principally belched gas from cows and sheep, also to a small extent from dairy effluent ponds. This research was extended to cover nitrous oxide from pastures (fertilisers and urine patches) shortly afterwards.

The Consortiums goal is to decrease NZ's total agricultural emissions by 10% by 2013, and their vision is to be a world leader in emission mitigation solutions for pastoral agriculture.[15]

The consortium is made up of eleven key agricultural organisations that cover science, farming, business and government and includes; AgResearch, DairyNZ, Fonterra, Meat & Wool NZ, Deer Research, PGG Wrightson, Fert Research, Landcorp, Foundation for Research Science & Technology, NIWA Science, MAF (NZ Ministry of Agriculture & Fisheries).

The PGgRc research program covers the following six areas;

[14] NZ Ministry for the Environment website, 28 July 2009; www.mfe.govt.nz/issues/climate/international/kyoto-protocol.html
[15] PGgRc, Pastoral Greenhouse Gas Research Consortium, Five year science progress report 2002-2007.

- Rumen ecology and microbiology – researching ways to inhibit methanogenesis by identifying, quantifying and culturing microbes in the rumen and investigating the impacts of these interventions on the long term functioning of the rumen ecosystem

- Methanogen genomics – analysing the genome of rumen methanogens to help develop new compounds and vaccines that reduce ruminant methane emissions.

- Methane vaccine – development of an anti-methanogen vaccine that will prevent the growth of methanogens and methane production in the rumen

- Animal selection and breeding – measureable differences in carbon emissions of different animals – researching for genetic markers to identify high and low emitting animals.

- Low greenhouse gas emitting farm systems – development of newest and best farm management technologies – plant and forage inhibitors

- Nitrification inhibitors – potential to mitigate nitrous oxide

The Consortium is confident that its continued investment in pastoral greenhouse gas research will place New Zealand in a better position to counter the effects of climate change.[16]

California – University of California, Davis

While in the USA, I met with Frank Mitloehner PhD, Assoc Professor and Air Quality Extension Specialist and he is based at the Department of Animal Science, University of California which is located at Davis just out of Sacramento. Frank is one of California's key emissions researchers and his program is one of a handful of programs dealing in emissions in the USA. He is the only one at the university doing this type of work for the dairy industry.

Franks current research activities are in two main areas:

- Air quality research related to livestock production, especially quantification of ammonia, dust, and odour emissions in dairies, beef feedlots, and poultry operations. Main objective is to help establishing environmentally benign livestock systems.
- Environmental physiology research, focusing on effects of air emissions on animal health and welfare.

[16] PGgRc, Pastoral Greenhouse Gas Research Consortium, Annual Report to the Crown 2008 , Wellington New Zealand

His previous research was conducted in the areas of air quality (dust emission and microbial sampling in feedlot cattle and pigs), environmental physiology (heat stress in cattle and pigs), and ethology (the study of the behaviour of animals in their natural habitat).

Frank outlined the work he was currently working on and the future direction of his research program and how production efficiency is very clearly linked to environmental impacts and this is now the focus of the Universities research program.

To conduct his emissions measurement research, Frank explained the type of equipment used which included large chambers that house three cows in controlled conditions and 'bubble corrals' (like sealed greenhouses) which are 100 ft long and 40 ft wide which house large numbers of cows

His work involves using dry cows (not milking), high lactating cows (milking), calves and steers and using breeds of cows such as Holsteins and Jerseys.

He initially went over some US emissions facts and figures; 55% of livestock greenhouse gas emissions come from enteric fermentation (methane from cows stomach); 27% from nitrous oxide from land application of manure and fertilisers and 18% from effluent ponds (storage and treatment). He further outlined that in the US livestock production emissions are dwarf by transportation and energy emissions – livestock is probably 3% of US emissions.

Feed additives and methane measurement

Frank explained that his research has shown that the 'biggest bang for your buck' was not through changing the diet of what you feed to cows but through feed additives such as Rumensin which changes the micro flora of the rumen. The University of California have now altered their research strategy to focus on feed additives such as Rumensin rumen modifier.

He explained that 6% of feed a cow eats is lost as methane but by feeding Rumensin this can be reduced. The 6% methane is a wasted energy that does not get converted into milk production and it is simply lost as the cow eats less and continues to produce the same amount of milk as a result. Rumensin reduces this energy loss and enables the rumen to take up this energy for increased production.

In response to my query on his thoughts on measuring methane in pasture based systems and he advised that it was very difficult and as it was done by using neck halters which can be inaccurate. He explained how this recording system works by placing the neck halter on the cow and a recordable trace emission called SF6 is released and recorded. Following this the cows own (belched) methane emissions are recorded and compared. He advised that the more roughage (such as pasture) in the diet the more methane produced which is considered less efficient than feeding a diet high in grains.

Manure digesters

The University is doing some work on methane capture from ponds and is developing a digester for lagoon waste. It will capture the whole universities waste which has 50,000 people and 1,000 cows and creates a large amount of biomass as the digester will need up to 8 tonnes of biomass per day. Microbes in the digester will digest and ferment the waste and create methane which will be burnt for electricity or ethanol, or hydrogen for use by the University.

Efficient feeding and efficient cows

To explain efficient feeding and efficient cows, Frank gave the following comparison of one cow which produces 30 litres of milk compared to three cows which produce 30 litres of milk together. The one cow has been fed a total mixed ration (silage, grains) and produces only 450g methane, whereas the three cows are pasture based and produce 1200g methane. Compare these systems on a 'per unit of production' basis, then the one cow is more efficient and has a lower emissions.

He explained that later in the day he would be presenting at the National Livestock and Poultry Environmental Learning Center on the topic of 'Greenhouse Gas Emissions from Livestock and Housing Systems' and would be speaking on the analysis conducted.

This analysis was conducted by Judith Capper who found that when comparing US dairies in 1944 to 2007, that modern dairies require 21% less animals, 23% less feedstuffs, 35% less water and 10% less land to produce the same amount of milk.[17] Frank explained that this results in 43% less methane and 56% less nitrous oxide produced per billion kg of milk which is due to the fact we are now breeding cows that are far more efficient at producing milk.

Frank continued that any further methane reductions must be based on improving efficiency on the farm. California has a compelling reason to work on this as the San Joaquin Valley has 20% of US cow numbers and there are over two thousand dairies in the region which have around two thousand dairy cows – the most cows in any region in the world.

Cow lactations

Research has shown that in the US over the last decade the proportion of a cow's life that she is milking has decreased from about 31 to 25 months (just over two years milking). This is

[17] Frank Mitloehner, Air Quality Education in Animal Agriculture Webcast Series, presentation through the Livestock and Poultry Environmental Learning Center, 15 May 2009 http://pubwiki.extension.org/mediawiki/files/e/e1/09mayPPmitloehner.pdf

largely because of reduced reproductive performance causing cows to be culled from the herd when they don't get pregnant which is a requirement for initiation of another lactation.[18]

Frank explained this research by stating that 15 years ago the average number of lactations in US cows was four, but this has now dropped to two and the average life of cow is now 4 ½ years as she is culled if she can't get back in calf. This is important because if there were four lactations there would be fewer replacement heifers needed and a farmer wouldn't need to run double the amount of replacement heifers.

The question was asked as to why reproduction efficiency is so poor and Frank explained that there has been considerable focus on maximising milk production during lactation at the expense of reproduction. Continuing that by increasing reproduction efficiency you will have a noticeable decrease in methane production by reducing the number of replacement heifers required.

Explaining further that a California dairy may milk 1,000 cows but it will also have about 1,000 replacement heifers. The cull rate of 30% is unacceptable in terms of environmental impacts as these cows haven't reached their peak in milk production. If the poor reproductive performance trend continues, ammonia and methane emissions will increase because the cow will spend less and less time producing milk over her lifetime.[19]

The University of California research focus is now on improving production and reproduction efficiency rather than just focusing on trying to reduce methane by 10% in a cow's diet, with the overall aim of producing the same amount of milk more sustainably with but fewer animals. For the University this means combining Frank's research area of environmental impacts and the area of reproductive physiology – they will need to work together.

Water quality trace back to farm

During my meeting with Paul Martin, Western United Dairymen he advised me that water quality is degraded across the State. Paul felt sure that this is due to leaking effluent ponds but hydrologists say that it's from the field application of manure on pasture that is the problem. They explained that plants don't take up all the nutrients (effluent, fertilisers) applied with the remainder leached into the water system.

To provide some insight into this the Western United Dairymen have provided partial funding into research that hopes to identify if the nitrate is biological in origin or from cattle and then have it traced back to the original farm that it may have come from.

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[18] Fadel, J. "Evaluation of Ammonia and Methane Emissions in the Dairy Industry Under Different Production Scenarios". *Keeping California's Dairy Industry Globally Competitive*, May 2008

[19] Fadel, J. "Evaluation of Ammonia and Methane Emissions in the Dairy Industry Under Different Production Scenarios". *Keeping California's Dairy Industry Globally Competitive*, May 2008

Paul felt that although this was expensive research it was worthwhile.

Netherlands – Wageningen University

On the 26 May 2009 I travelled from Amsterdam to Lelystad by train to meet Jan Bloemert, Farm Manager of the Melkveebedrijf research farm. This research farm is part of the Animal Sciences Group, Waiboerhoeve Dairy Research Centre of Wageningen University in Lelystad.

Waiboerhoeve is a large scale dairy farm with 500 dairy cows and it is one of five research centres for dairy cattle. The centre building housing the cows is 116 metres long and 46 metres wide with a plastic foil roof, four floor systems including slatted floors and two robotic milking systems.[20]

Jan explained that an important part of his role as research farm manager was working with the researchers on the practical aspects of managing the dairy and cows in enabling them to conduct their research projects.

I was advised that the average research project was around six to seven months (quite short), but these occasionally often rolled into another project. Longer projects ran for two years. The researchers are from the University and the farm conducts a wide range of research which is usually done around calving time (four weeks before and eight weeks after) as this is considered the best time for the researchers to do their work.

Research projects include;

- Lactation and calving
- Feed fibre experiments
- Automatic (robotic) dairy system
- Experimenting with bedding – running a compost system of flooring
- Animal welfare - improved flooring, walls and roof. This is done for improved animal welfare requirements set by government and to reduce emissions.
- Hoof health – infectious diseases in hooves – reduced problems with the wooden slatting.
- Ammonia reduction rubber matting on slatted floors

Ammonia reduction rubber matting on slatted floors

This research project was aimed at reducing ammonia emissions from dairy effluent which emit from under cow shed flooring. Rubber is wrapped around wooden slatting which the

[20] Waiboerhoeve research centre dairy farming, Animal Sciences Group, Wageningen University

cows stand on and white hobs (baffles) is inserted between the slatting to reduce the emissions from escaping from the pit below the flooring. Jan said that these hobs reduce the ammonia emissions by up to 50%.

A manure scraper is automatically pulled across the flooring to force the manure down into the pit which is cleaned out many times per year - starting in spring (March) end in August. The research farm is restricted in when this can be done as the effluent is applied directly on to pastures and they are not allowed to do this during the wetter times of the year (from September through to January).

An Irish company who originally sponsored this research and is now commercialising this product for sale. The company is having some difficulty getting on to the market as Jan commented that farmers are not yet convinced of the need to buy this to reduce their emissions.

Recommendation

1. The Australia dairy industry is working actively on research areas of feed, methane reduction, genetics. Across industry research projects includes the following initiatives;
    - Genetic markers for dairy cattle for climate change adaptation
    - Methane reduction through dietary supplements, vaccinations and rumen genomics
    - Soil carbon science
    - Implications of an emissions trading scheme on agriculture
    - Water use
    - Pasture management
    - Forage and pasture management

    Recommend that the industry take on board the direction of the University of California's program of improving cow fertility and the likelihood of better results not just for on-farm productivity - but also for reduced methane and environmental impacts as less replacement stock will be required. *Note: US herd fertility levels are lower than in Australia.*

Emissions Reporting and Measurement

California – Western United Dairymen

An important part of my study tour was to gain an understanding of dairy farmers who were already undergoing measurement and reporting of emissions. In California the dairy industry is required to report on Reactive Organic Gases (ozone precursors) and Particulate Matter (ingestible matter 2.5 micron or less) which aren't greenhouse gas emissions (methane, nitrous oxide and carbon dioxide).

The California dairy industry is one of the most regulated States in the US in regards to environmental issues. I wanted to discuss what sort of measuring and reporting obligations their dairy farmers were under and from what level of government (Federal and/or State).

As I had previously noted I had met with Paul Martin, Environmental Services Director with the Western United Dairymen. He said that to help dairy farmers with the increasing amount of water and air quality regulations their organisation provides a service (by fee) called the Western United Environmental Services. This service provides environmental expertise to dairy producers who are finding themselves overwhelmed by environmental regulations, the most recent being the complex and costly Waste Discharge Requirements that affect Central Valley dairies. This service helps farmers with anything from submitting required reports or taking samples to doing all monitoring, sampling and reporting. [21]

In order to deal with environmental issues in the Central Valley a new program was recently developed called the Waste Dischargery Program which aligns with the Federal requirements. Federal systems only covers surface waters and the State systems covers ground waters.

This complicated regulation (138 pages) is very heavy on monitoring and reporting, engineering requirements and pond construction. Compliance with this regulation results in the development of a waste management plan which includes facilities, infrastructure and a nutrient management plan. The nutrient management plan outlines how the manure is applied back on to your pastures at the correct rate. This combined with soil and water testing indicate application rate to ensure nutrients are taken up by the pasture.

I was advised that this program has only been in effect for two years and has a five year implementation schedule and there is an estimated cost of approximately US$30,000 for 1,000 cow dairy farm.

[21] Western United Dairymen website, 29 July 2009; http://westernuniteddairymen.com

The regions regulatory authority, the San Joaquin Regional Water Quality Control Board is provided with the power to implement these requirements through federal government legislation, the Clean Water Act. There are nine different water quality regions within the State and each one has a spectrum of control measures. There is a similar arrangement for the Clean Air Act where there are 35 regions within the State, each one has responsibility to the Federal Clean Air Act, which covers not only dairy farms but other industries. The dairy requirement of this Act has only just been formalised.

The Western United Dairymen have been working closely with dairy farmers on this and participation has been very high but it was noted that the economic situation is difficult at the moment and the industry is going through a tough time.

Paul Martin explained that he is part of the policy group of the Western United Dairymen and they are in partnership with the California Dairy Quality Assurance program (CDQA) an education group for dairy farmers.

The CDQA program was launched in 1997 and is a mechanism by which a dairy producer could voluntarily have their facility 'certified' as complying with all State and Federal regulations. The program was modelled after other successful regulatory/industry agreements which had eradicated Brucellosis from California and had allowed for voluntary industry-based certification of the State's egg farms. The Dairy Environmental Stewardship Program is educational in nature with both classroom and on-site assistance.[22]

Paul explained that if the San Joaquin Valley Air Quality Board finds that a dairy farm is not meeting the requirements it will be classified as 'non attainment' – not meeting Federal Standards for air quality. The dairy farmer will be required to install various control measures on their farms and continue closer reporting on the Reactive Organic Gases and Particulate Matter.

If the report indicates that the on-farm Particulate Matter is below a factor of ten then the dairy farmer will be required to implement a Conservation Management Practice Plan. This requirement is currently only required in the San Joaquin Valley and a dairy farmer will have to produce this plan on demand by authorities.

Under this Conservation Management Practice Plan the dairy farmer will report on areas such as the cow corrals (pen or yard), roads or work areas where he stores equipment. The farmer can choose a number of control measures such as oiling the roads to control dust (petroleum oil that does not leach into water ways), or he may choose to put up signs advising employees of the control management measures in force.

[22] California Dairy Quality Assurance Program website, 6 August 2009, http://www.cdqa.org/

A dairy farmer is required to hold a permit for Reactive Organic Gases (ozone precursors). This is a menu based requirement depending on the areas on the dairy farm milking parlour (dairy), feed and storage areas, and lagoons (effluent ponds). These emissions are measured by the area not by intensity, so based on this type of calculation the larger the lagoons and feed areas the more emissions.

Paul explained that the only emissions controlled by the Government Air Districts are stationary emissions. Stationary emissions are more easily captured when emitted from sources such as a smoke stack. Most emissions on a dairy are fugitive emissions (leaked, escaped).

The only area on the farm where is it possible to capture emission is the lagoon area through covers and anaerobic digesters. The Air District initially was planning to impose a requirement that all new dairies would have to install a digester on their lagoons. The Western United Dairymen took the Air District to court at a cost of US$500,000 to reverse the decision as this requirement would have placed a huge additional cost impost on to all new dairy farms.

The court decision was that as the lagoons were the only source of stationary emissions on the farm and were not emitting reactive organic gases and that new dairies would be built with a digester cell on the lagoons but not covered until the research proved that it was necessary.

The subsequent research conducted showed that stationary emissions were primarily methanol and ethanol which stay suspended in the water and are not being released into the air. The Air District accepted this decision.

Paul explained that there are difficulties across the responsibility areas of their local authorities, as the Air District has responsibility for stationary emission sources and the Air Resources Board has responsibility for the mobile sources. When new rules are developed by the Air District they are submitted to meet the requirements of the State Implementation Plan. The State reviews the rules and if it agrees submits them to the US EPA (Federal body) for consideration of approval.

Paul advised that ammonia and reactive nitrogen emissions are going to be an issue for the dairy industry in the future, especially nitrogen. He said a lot is being done on-farm to reduce ammonia production which are classified as criteria pollutants. The Californian dairy industry has been working on these criteria pollutants and now greenhouse gas (GHG) criteria is starting to collide. He explained that as some of the things you do for criteria pollutants have an adverse effect on GHG emissions. For example; using methane from anaerobic methane digester is the easiest way to use it is on farm but has to be converted into electricity and sent on to the towns where it is needed. But when you run a combustion engine to convert the gas you are creating nitrous oxides. The Air District is very reluctant to allow farmers to do this. Generally there is not enough money in it at present. Calculations can be made on how much manure can be collected.

Paul said that there needs to be ways to allow alternative ways to capture and use the energy such as making vehicle fuel or taking raw gas and running a mill or something similar. But then you run into Land Use Planning regulations who say that this is an industrial use and you can't put it into industrial use on a farm. Ultimately the best way to use it is in its raw form to heat a water boiler on farm. He advised they are in the early stages of this at the moment but unfortunately people want quick answers and it has taken a long time to get to where they are at the moment with this technology.

And it's going to take a long time to work it out – new technology is going to come along such as gasification of dairy manure but it has to be wet gasification and they don't know yet what emissions will come out of this process. This research is being done by the University of California at Davis on walnut shells – making electricity by gasification of shells called thermal conversion. Paul said that biochar is also being worked on for biofuel where some will go back into pastures for range land sequestration.

California – Western United Dairymen - dairy farm visits

While in California I had the opportunity to meet with two of Western United Dairymen Field Representatives, Tessa Curti and Jake Oosterman, who took me to visit a number of dairy farms in their regions. During some of these visits the level of permit and emissions reporting requirements were discussed.

The following is just a brief overview of some of the extensive maze of permit and reporting requirements by the San Joaquin Valley Air Pollution Control District, local county or city offices for dairy farms to operate.[23]

- *Land Use Authorisation forms*
    - Local Country or City Office zoning law permit requirements.

- *Initial Permit Application for Farms*
    - San Joaquin Valley Air Pollution Control District form
    - This form should be filled out for all agricultural farms including all crops and Confined Animal Feeding Operations such as dairies, beef lot cattle ranches, chicken ranches, turkey ranches, swine operations etc.

[23] San Joaquin Valley Air Pollution Control District, July 2009, website www.valleyair.org

    - This form requires the prior submitting of the Land Use Authorisation forms from Local County or city office.

- *Initial Permit Application for Dairy Farms*
    - San Joaquin Valley Air Pollution Control District form
    - This form requires details such as;
        - Submitting applicable county approval document for the dairy (eg. Site Approval, Site Plan Review, Site Improvement Plan etc).
        - Listing the number of cows currently in the dairy and type of housing (eg. Milk cows, dry cows, heifers etc and flushed freestalls or scraped corrals etc).
        - List the maximum number of cows that can be housed in the dairy based on its capacity.
        - The number of freestalls, open corrals, calves, other housing
        - Type of milking centre, type of hospital milking centre,
        - Waste handling: eg. Anaerobic treatment lagoons, aerated lagoons, digesters, ponds, settling basins, separators, composting, etc
        - Liquid manure handling: eg. Number of separators and what is done with solids; how many lagoons, size, depth, emissions control devices
        - Solid manure management and storage: how is it stored, how is it managed
        - Composting: what type of composting eg. Windrow, aerated static pile etc
        - On field activities: crop land acreage, methods of applying manure on the land eg. Flood irrigation, solid spreading etc.
        - Feed storage methods and feeding out systems
        - Listing of other equipment on farm; eg. Grain storage silos, gas tanks etc.
        - Request for a Conservation Management Practice Plan to be submitted as well.

- *Conservation Management Practices application*
    - San Joaquin Valley Air Pollution Control District form.
    - This form is required for the purpose of reducing air pollutants from agricultural sources.
    - The San Joaquin Valley Basin is an area designated as ‘serious non-attainment for particulate matter smaller than 10 microns in size’ and is required by federal laws to implement Best Available Control Measures on all significant sources of emissions.

  - The Conservation Management Practice Program is to implement Best Available Control Measures on agricultural sources to achieve particulate matter smaller than 10 microns emissions reductions to help meet the five percent per year reduction in these emissions starting in 2003 until attainment is reached.
  - Mandatory requirement to participate for dairies over 500 mature dairy cows.
  - Required on-going reporting on the areas outlined in the *Initial Permit Application for Dairy Farms*.

- *Conservation Management Practices: Dairy (supplementary form)*
  - San Joaquin Valley Air Pollution Control District form
  - This form requires details on the
    - Maximum number of milk cows, dry cows and support stock on farm
    - Corral manure handling eg. fibrous layer in dusty areas or frequent scraping and/or manure removal
    - Overall management feeding practices eg. Bulk materials control or feeding young stock near dusk.

- *Rule 4570 Permit Application Form: Dairy Confined Animal Feeding (CAF) Mitigation Measures*
  - San Joaquin Valley Air Pollution Control District form
  - All other forms required to be submitted prior to submitting this form.
  - This form requires details on the farms mitigation measures for;
    - Feed, milk parlour, freestall barns, corrals, solid waste, liquid waste and land application.

- Dairy Compliance Checklist
  - San Joaquin Valley Air Pollution Control District form
  - Daily or weekly record of mitigation measures which have been identified in the Permit to Operate eg.
    - Check uneaten feed is removed from feed lanes
    - Check fields were visually inspected to verify that liquid animal waste did not remain in the fields for more than twenty four hours after irrigation
    - Record depth of manure in the corrals at the highest point every 90 days (must be less than 12”)

- Compliance Rule 4570 dairy inspection form
  - San Joaquin Valley Air Pollution Control District form
  - Recording keeping checklist form on the farms mitigation measures for;

- Feed, milk parlour, freestall barns, corrals, solid waste, liquid waste and land application.

All these Californian permits and reports carry fees of some sort and from discussions with dairy farmers on my on-farm visits I found that third party auditors (for local, state and federal reporting) visit farms on a monthly basis to check the farms records.

Californian dairy farmers spend an incredible amount of time and money to comply with an overwhelming amount of government regulations.

Recommendation

1. The US example of over regulation is an important message for the Australian dairy farmers.

   The Australian dairy industry has a good history of working collaboratively with all levels of government resulting in effective industry led initiatives. It is important the industry continues to work proactively and constructively with government to eliminate the need for restrictive levels of government legislation.

Carbon footprinting and labelling

United Kingdom - Carbon Trust

During my visit to the UK I organised a number of meetings with organisations involved with dairy emissions carbon footprinting (on-farm and post-farm) and the move in the UK towards carbon emissions labelling on products. The areas of discussion on accurate carbon production measurement included on-farm modelling, meaningful labelling and evaluating consumer understanding and sentiment.

My first meeting was with Robin Dickinson, Senior International Projects Manager, with the Carbon Trust based in London.

The meeting commenced with a discussion on the work the Carbon Trust had done with Cadburys in developing the *'Cadbury Guide to Low Carbon Dairy Farming'*. This collaborative work is part of Cadbury's *'Purple goes Green'* environmental initiative which had identified that 60% of their carbon footprint came from milk production.

The work has now resulted in Cadbury's being able to calculate the carbon footprint for its milk chocolate through such actions as improving herd health and welfare so cows produce more milk, more prudent use of fertilisers and reducing energy consumption by using timers or sensors.[24]

Robin advised that the Carbon Trust's work is much broader that the Cadburys program as they have been working with the UK dairy levy boards plus various consultancy firms to develop a standard modelling mechanisms of carbon footprinting of milk. This modelling goes up to the farm gate.

The Carbon Trust decided to look into broader on-farm modelling programs as some supermarkets were looking into moving down the whole supply chain (manufacturing, distribution etc) in accessing carbon emission for some of their dairy products. So the Carbon Trust spent some time developing rules around how to measure the comparative footprint of milk at the farm level.

What the Carbon Trust has done was align the various calculators as there are a number of consultancies who are using various models. Two models, one from AB Agri and the other from Kite Consulting will be used at farm gate level, there are also various models used by the milk processors.

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[24] Greenbiz,*'Cadbury Partners with Dairy Farmers to Shrink the Carbon Footprint of Milk Chocolate', 18 February 2009, Greenbiz website*

Detail on the AB Agri emissions modelling work explains the need to address impacts on the environment through better measurement and modelling of on-farm emissions. Continuing, that farmers need to know how much of each of the major gases (methane, nitrous oxide and carbon dioxide) they are currently producing and from what farming activities if they are to contribute to emissions reductions.

Over 300 dairy farms were tested and evaluated in the development of the model covering areas such as animal nutrition, feeding, rumen function and farm management.[25]

Robin said that the Carbon Trust provides a verification service around the models by aligning the models, validating calculations and baseline so data can be certified at farm level.

The Carbon Trust program is based on certifying farms for two years for on-farm emissions reductions (re-certified every two years) during that time there must be emission reductions of an unspecified amount.

When I queried Robin about how does a dairy farm choose between the models offered he explained that the models are promoted in a variety of ways as they all offer different propositions.

One of these is Dairy Crest (dairy food company working with AB Agri) which he explained is competent about bringing farmers up to speed. The other modelling consultant is working with various milk processors to analyse their pools and how to work with their farmers in accessing their emissions on-farm.

The milk processors are working to identify the top to bottom quartile of emissions producing farmers to reduce the extremes, he explained that this was linked to competitive advantage for milk processors product. The Carbon Trust is aiming to calculate how many emissions per litre of milk.

In response to the question of whether the Carbon Trust recognises a plateau point for reductions of natural gases from cows, the answer was that they are aiming for absolute reduction of emissions from cows over twenty to thirty years.

Robin explained that they would achieve this by assessing the whole lifecycle of a herd as there is quite a difference between the best performing farms to the worst performing farms. Gains can be made from best management practice - through reduction management, herd use and feeds in the short term.

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[25] AB Agri, Associated British Agriculture, *'Sustainable supply chain solutions: Greenhouse Gas Modelling'* 2009

In the long term, pharmaceutical research is progressing in managing enteric emissions (methane from cows stomach) – vaccinations aid rumen digestion to reduce methane and improve feed efficiencies and convert methane from a wasted energy source. Robin said there are all sorts of advancements occurring and if you plan it out over 20 to 30 years they start to impact on emissions reductions.

During our meeting Robin advised of a collaboration project between the Carbon Trust and the Australian Government to establish the Australian Carbon Trust. At the time of our meeting this program had not been announced by the Government.

On my return the Australian Government announced the program details (22 July 2009) which included $50 million in seed funding for business sector energy efficiency and a fund to register small individual financial contributions to emissions reductions.[26]

Robin advised that the Carbon Trust have done quite a lot of policy work in this area with the Australian Government.

The Australian Carbon Trust differs from the Carbon Trust in the UK in that the British have not implemented a fund for individual action.[27]

United Kingdom - Tesco Stores Ltd

The uptake of carbon labelling in the UK is not only driven by such organisations as the Carbon Trust but also the supermarket chains such as Tesco. Tesco's is the largest grocery retailer in the UK (third largest in the world) and over 30 million people shop at Tesco's worldwide every week.[28]

I organised to meet with Emma Rutter, Agricultural Manager Dairy, in Tesco's head office in Cheshunt north of London to find out Tesco's movement into carbon labelling of products.

I had previously understood that Tesco's were working closely with their 800 dairy farmer suppliers on carbon footprinting all of their dairy products and wanted to know how this was progressing. These 800 dairy farmers produce 1.3 billion litres of milk which is 10% of UK dairy production.

In 2006, Tesco launched its 'Community Plan' which covered a wide range of corporate and social responsibility areas and identified three strategic priorities for tackling climate change:

- Setting an example by measuring and reducing Tesco's own direct carbon footprint.

[26] The Australian, *'Howard minister to lead carbon trust'*, 22 July 2009, Melbourne, Australia
[27] The Australian, *'Howard minister to lead carbon trust'*, 22 July 2009, Melbourne, Australia
[28] Carbon Trust, *'Working with Tesco: Product carbon footprinting in practice'*, Case study CTS055, October 2008

- Using 'resources and relationships to work with others to achieve a low carbon economy of the future'.
- 'Empowering customers to make environmental choice by providing the information on which to make an informed choice'.

As part of the development of its Community Plan, Tesco asked consumers about their attitudes to climate change. It found that many consumers wanted to do more to mitigate climate change.

In response to this, Tesco launched a broad initiative in January 2007 to empower consumer decision making by measuring and providing carbon information on everything Tesco sells.[29]

But from my discussion with Emma I found that this has turned out to be easier said than done. She explained that their analysis has shown that one dairy product may have a low carbon footprint and another could be high. They have many producers and products and have found it difficult to standardise any of the products (milk, yoghurt, cheese, dry milk powder and speciality products).

Tesco's have footprinted products such as light bulbs and washing powder due to the more standard measurement involved in manufacturing and distribution processes and have made recommendations to their consumers to further reduce emissions by drying clothes naturally outside rather than using a dryer.

Please note: On the 17 August 2009 Tesco media release announced that Tesco full fat, semi-skimmed and skimmed milk ranges will display the carbon footprint label as part of the company's groundbreaking work to include carbon labels on Tesco products. Continuing, it is a major milestone in the company's pledge to have footprinted 500 products by the end of the year.[30]

United Kingdom - DairyUK

My meeting with Fergus McRenyolds from DairyUK continued with a discussion on carbon footprinting and labelling. He explained that across the UK's dairy regions there are is a wide range of farming systems (possibly unlike other parts of Europe) and they found there needed to be some flexibility for dairy farmers in achieving the Milk Roadmap targets.

The economic downturn has proved challenging for all, but it was identified that there are still a lot of things that can be done to make efficiencies especially in areas of resource efficiency.

[29] Carbon Trust, *'Working with Tesco: Product carbon footprinting in practice'*, Case study CTS055, October 2008
[30] Tesco press release, '*Great British pint of milk reveals its carbon footprint*', from website www.tescoplc.com, 17 August 2009

There has been a positive focus on working with what you have and how you use it, and achieving cost effective management.

Fergus explained, that for those farmers who have chosen to go down the carbon footprinting path because it highlights the whole on-farm carbon structure, said this was as much about money saving as it was about energy saving (and therefore emissions reductions).

But the last two summers in the UK have been very wet which has had a knock on effect in reducing silage production for dairy farmers. This has increased the amount of feed that has to be brought in – and by doing this it will affect the farms carbon footprint. Fergus said the industry is making considerable effort but the weather can have a detrimental effect on the farms carbon footprint.

Fergus said that the UK dairy industry does not support carbon labelling – but they support carbon measurement and emissions reduction but not labelling as it is so variable. He continued by saying that research on labelling in the UK shows that consumers are over exposed to information and there are too many labels on products.

Recommendation

1. DairyUK's supports carbon footprinting through on-farm lifecycle analysis and promotes the dairy industry's work on emission reductions, but it does not support dairy produce labelling of the products carbon footprint and views these as quite separate areas.

   Recommend that the Australian dairy industry keep these two areas separate – carbon footprinting analysis does not automatically lead to labelling dairy products due to issues in the accuracy of measuring on-farm emissions.

   Research has indicated consumer confusion regarding the information on the label and what emissions have actually been measured and recorded.

Conclusion

Over the six weeks of my Fellowship I travelled to many countries and spoke to many specialised individuals about their countries progress on dairy emissions measurement and reporting approaches, mitigation research, policy development, carbon footprinting and product labelling.

Despite the large distances, varying dairy farming techniques and differing political pressures it was pleasing to note that all were taking the issue of dairy emissions seriously and applying incredible focus on their particular areas.