



A Nuffield Farming Scholarships Trust

Report

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**Communicating carbon
reduction schemes to farmers;
busting preconceptions, driving
efficiency and profit**

Becky Willson

July 2017

NUFFIELD UK

NUFFIELD FARMING SCHOLARSHIPS TRUST (UK)

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A

Nuffield (UK) Farming Scholarships Trust Report



Date of report: July 2017

*"Leading positive change in agriculture.
Inspiring passion and potential in people."*

Title	Communicating carbon reduction schemes to farmers; busting preconceptions, driving efficiency and profit
Scholar	Becky Willson
Sponsor	AHDB Beef and Lamb
Objectives of Study Tour	To understand the opportunities for UK livestock farmers to effectively reduce on-farm greenhouse gas emissions and increase soil carbon sequestration potential. To seek out good examples of communication and knowledge transfer to farmers on this subject and examine what is working in terms of inspiring action and behavioural change.
Countries Visited	Scotland, Ireland, Italy, America, Australia and England
Messages	<ul style="list-style-type: none">• Carbon management on-farms is complex, there needs to be a multi-dimensional strategy that involves farmers, advisors, researchers and policy makers to achieve reduction targets. However although complex, the time to act is now.• Soil health is of critical importance and is at the centre of profitable, resilient and sustainable farm businesses. We must protect it at all costs.• Farmers provide an invaluable knowledge source on what works on the ground. They should be co-creating research projects that fit industry need.• It is crucially important to highlight positive stories and engage with farmers in a positive way.• A consistent carbon footprinting methodology that includes soil carbon and is practical at farm level is urgently required.• Credibility, practical knowledge and relationship with the farmer are all crucial attributes to people communicating mitigation opportunities.

EXECUTIVE SUMMARY

Climate change will adversely affect some of the most fundamental determinants to life, including food, air and water.

Global scientific and political consensus is that climate change is happening due to greenhouse gas (GHG) emissions released by human activity. Farmers and growers can produce quality food, enhance biodiversity and sequester carbon by making management changes to their business, usually with improvements in efficiency and profitability as a result. However, the dilemma exists that for the majority of farmers, reducing GHG emissions is not a business priority. So how do we talk to farmers about climate change in a way that engages them, and develop policies and projects that enable effective behavioural change?

The aim of my study was to understand how to effectively communicate the benefits to the farm business of reducing greenhouse gas emissions and get farmers interested and engaged in changing management to reduce emissions. This involved visiting policy makers, projects, researchers and farmers to gain a deeper understanding of what worked well, how policy could be used to drive action, where the knowledge gaps were in research and what the drivers were that had encouraged farmers to change management to be more sustainable

I concluded that although the issue is complex, emissions associated with agriculture must be reduced. This is intrinsically linked with driving efficiency and realising economic savings. This requires consistent use of metrics that link the emission reduction potential with economic savings and make sense for farmers.

The potential around improving soil health and sequestering carbon within farm soils should not be hampered by lack of replicated science. Agriculture is unique in its ability to achieve this, and there is an urgent need to connect research with the farmer innovators to develop the baseline data that is required to shape policy. Action is required on emissions reductions and soil carbon to achieve targets.

There is a need to stand up and communicate the positive activities that are taking place within the industry, including the rising soil health movement and those farmers who are managing landscapes, producing food and reducing emissions. By encouraging positive stories there is an opportunity to inspire other farmers and celebrate achievements with policy makers and consumers.

Contents

EXECUTIVE SUMMARY

Chapter 1: Personal Introduction	1
Chapter 2: Background to my study	2
Chapter 3: My study tour.....	3
Chapter 4: Farming, Greenhouse Gas Emissions and Carbon	4
4.1 Agriculture and Climate Change	4
4.2 Agriculture’s contribution to global emissions	4
4.3 National policies and targets	5
4.4 Where next?.....	6
Chapter 5: Science meets practice – methods to reduce emissions	8
5.1 Current research challenges	8
5.2 Engaging farmers in research.....	8
5.3 On-farm action, Farming for a Better Climate	8
5.4 Climate Clever Beef, assessing potential and driving policy.....	10
5.5 Social science - the missing link?	11
Chapter 6: Metrics and models.....	13
6.1 The importance of carbon footprinting	13
6.2 Current standards and methodologies	13
6.3 Farm Level footprinting.....	13
6.4 Integrating metrics with delivery	14
6.5 Efforts of the Supply chain	14
6.6 Case study: Using the Cool Farm Tool with poultry producers in America	15
Chapter 7: Supporting behavioural change: policies, penalties and payments	17
7.1 Integration of climate change efforts into agricultural policy	17
7.2 Green marketing, selling carbon.....	18
Chapter 8: Communicating Carbon.....	19
8.1 Communicating science	19
8.2 Language	19
8.3 Case Study: Graeme Anderson, the Climate Dogs	19
8.4 Framing the issue	20
8.5 Overcoming preconceptions.....	21
8.6 The use of values in communication to empower action.....	21
8.7 The issue of scale	23

8.8 Case study: 10,000 actions The University of Manchester, small steps, big change.....	23
8.9 'Climate hell doesn't sell' – making it positive.....	23
8.10 Case study: Planet to plate – the Earth Hour Cookbook	24
Chapter 9: Converting knowledge to action, achieving the elusive behavioural change.....	26
9.1 Talking to farmers, what drives change?	26
9.2 Engaging advisors – The Farm 300 project	26
9.3 Farmer to farmer – collective action	28
9.4 Developing networks that make a difference.....	29
9.5 Engaging the next generation	29
Chapter 10: Soil Health and Carbon Sequestration	31
10.1 The Soil Health Movement	31
10.2 Payments for services – the case of soil carbon	32
10.3 Farmers focussing on soil health in Nebraska	33
Chapter 11: Conclusions	36
Chapter 12: Recommendations	37
For policy makers	37
For the industry.....	37
For projects and research	37
Chapter 13: After my study tour.....	38
14. Acknowledgements and Thanks	39
People that I met:.....	40
15. References	47

Table of Figures

Figure 1: The author, Becky Willson

Figure 2: Global Greenhouse gas emissions by economic sector (Source: IPCC, 2014)

Figure 3: Key Actions for all farm types (Source: GHG Action Plan)

Figure 4: Key Actions for Livestock Farmers, (Source: GHG action plan)

Figure 5: A fully operational R and D Chain, Source – The need for a new vision for UK agricultural research and development, Professor David Leaver

Figure 6: Farmers at an on-farm beef event, Grantown on Spey, July 2016

Figure 7: Communicating science on-farm, demonstrating economic, efficiency and environmental benefits of changing management

Figure 8: Case study publication from Climate Clever Beef

Figure 9: Woody regrowth and cattle at Coonabar, with Murray and Wendy Gibbons

Figure 10: Natalie Umphlett and Crystal Stiles, climatologists from the High Plains Research Centre Nebraska working on the Useful to Usable project

Figure 11: COMET-Farm team, Mark Easter, Dr. Keith Paustian, and Amy Swan, Colorado State University,

Figure 12: An example report from Alltech E-CO₂ that breaks down emissions sources (left hand page) and shows the performance of the farm compared to the top 10% performing herds and the average.

Figure 13: Presentation slide detailing the use of language in communicating climate change, from IPCC presentation, World Symposium on Climate Change, February 2017

Figure 14: Two of the climate dogs from the award winning animation. (Source: [Agriculture Victoria](#))

Figure 15: Poster at Pennsylvania Association of Sustainable Agriculture conference, February 2017

Figure 16: Derek and Kirrily Bloomfield, Australian Beef farmers direct marketing their holistic production system under the brand “The Conscious Farmer”

Figure 17: Charlie Arnott, Farmer from Boorowa, New South Wales

Figure 18: The Planet to Plate Cookbook

Figure 19: An example from the Planet to Plate cookbook, including scientists, chefs, and farmers

Figure 20: Meat and Livestock Australia, Sydney

Figure 21: Chairman Brian Kemp at the Vermont Agricultural show

Figure 22: Meeting of the Champlain Valley farmer Coalition (credit: Champlain Valley Farmer Coalition website)

Figure 23: Farmers for Climate Action logo

Figure 24: Young Farming champions logo, (Source: [YFC Website](#))

Figure 25: Principles of the Soil Health Movement, (Source: [Steve Rosenzweig](#))

Figure 26: Terry McCosker, Carbon Link and Resource Consulting Services

Figure 27: Del Ficke and his wife in a field on their farm, Nebraska, USA

Figure 28: Digging soil pits in freezing temperatures on Del's farm, Nebraska

Table 1 - Main GHGs from agriculture, common sources and mitigation opportunities

DISCLAIMER

The opinions expressed in this report are my own and not necessarily those of the Nuffield Farming Scholarships Trust, or of my sponsor, or of any other sponsoring body.

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Chapter 1: Personal Introduction

I am not from a farming background, but, for as long as I can remember, farming is all I've wanted to be involved in. Having graduated with a degree in Agriculture from Aberystwyth, I spent the next three years happily milking cows in Warwickshire and Kent. In 2006 we relocated to Devon. I started looking after a dairy herd, however my first direct experience of bovine TB happened abruptly, and after a sobering 6 months watching cow after cow disappear off the farm and the herd completely decimated, it was time to move on.

After a brief foray back into farm based education, designing programmes to teach children about where their food comes from, and having produced a child myself, I found a job working at the Regional Development Agency helping to deliver European funding for farmers. As well as teaching me how to sit still in an office all day, it was a fantastic opportunity to understand about how European funding worked. With the change of government, I left and went to work on a resource management project for farmers based at the Rural Business School at Duchy College.

That was eight years ago. I have remained at the College on resource management projects: first on the [SWARM Hub](#), then subsequently on projects focussed on farm research, developing knowledge transfer tools for farmers (including the [Farm Crap App](#)) and working on managing resources and carbon with farmers in the South West.

In January 2014, soon after I returned to work from having my second child, I joined the [Farm Carbon Cutting Toolkit](#). A farmer-led organisation working on providing technical information for farmers on greenhouse gas emissions and carbon sequestration seemed like the perfect solution to get my baby brain working again, and it was to be the start of a great new adventure.

Now I split my time between working for Duchy as a technical specialist on resource management and working as a project manager for the Farm Carbon Cutting Toolkit. Both roles allow me the great opportunity to do what I love best, talking to farmers about ways to improve profitability while at the same time safeguarding resources.

Nuffield has provided the perfect opportunity to step away from the day job and go and meet inspirational people around the world. I am incredibly grateful to Nuffield, my sponsor, my employers at Duchy and FCCT and my family for allowing me to grasp the opportunity.



Figure 1: The author, Becky Willson



Chapter 2: Background to my study

Climate change will adversely affect some of the most fundamental determinants to life, including food, air and water.

To quote Sir John Beddington, “*we need 50% more production, on less land, with less water, using less energy, fertiliser and fewer pesticides by 2030.*” Because of the diverse nature of farm systems and variations in climatic conditions, there is not a ‘one size fits all answer’ or a ‘silver bullet’. It is all about marginal gain.

As well as the wider societal reasons for farmers to take action on climate change and the changing weather patterns, there are opportunities to make economic savings and drive efficiencies. Careful use of resources, the potential for generating renewable energy and using energy more efficiently on-farm all offer the potential to increase profits and help businesses become more resilient.

Increasingly, the supply chain will be pressured from regulators and consumers to examine the environmental impact (along with carbon) of their produce. Farmers as a key component of that chain will be asked to report on carbon credentials (as some already are) and taking action now will put farmers at a competitive advantage in the near future.

Understanding the roles and opportunities for farmers within the climate change agenda is a crucial step that we need to address now. If we can look at the most effective way to communicate the issue, develop robust metrics, create tools that have worth at a farm level, and involve farmers in the decision making process then we can develop an integrated and effective approach.

My study focussed on two main questions:

firstly, what are the strategies and techniques by which farmers can reduce emissions?

secondly, how do we communicate these messages in a way which engages and inspires them to take part?

But these questions needed to be considered in the contexts of:

To develop sustainable, profitable and resilient farming businesses, we need to accurately assess and manage emissions associated with agriculture.

To get the industry to engage, we need to be innovative and creative in our dissemination and to have robust core science that shows the business benefits of reducing emissions and to create a resilient system that works for farmers, the environment and wider society.



Chapter 3: My study tour

I had two aims when I was planning where and who to visit for my Nuffield travels. One was to connect with projects that were aiming to help farmers adapt management and change practices to improve resilience, sustainability and emissions reductions. This would involve understanding how projects were set up, implemented and monitored as well as understanding the policy drivers and mechanisms through which these projects were designed and funded. The second aim was to talk to farmers who had made changes and were doing things differently, to start to understand what had motivated them to change.

Date	County Visited	Why?
June 2016 (1 week)	Italy, FAO Headquarters, Rome	Global Alliance on Climate Smart Agriculture (GACSA) Annual Forum.
July 2016 (1 week)	Scotland	The Farming for a Better Climate project was one of the initial inspirations for my Nuffield application. I also wanted to visit researchers who have been working on uptake of metrics and soil carbon (Aberdeen) and achieving behavioural change (Edinburgh).
September 2016 (4 days)	Cork, Ireland	European Conference on Rural Development and visit farm advisors to understand drivers behind Origin Green and implementation of the Carbon Navigator
September / October 2016 (3 weeks)	Australia	To visit projects, researchers and farmers engaged in climate mitigation activities who are directly experiencing climate variation.
January / February 2017 (3.5 weeks)	USA	To find out whether having publicly funded extension services and payments for practice enabled long term behavioural change.
February 2017 (3 days)	Manchester	World Symposium on Climate Change Communication. Bringing together practitioners from all sectors with the core theme of how to communicate climate change.
Throughout 2016 / 17 (2 weeks)	The UK	In order to create recommendations that work and fit with current priorities, I have travelled extensively round England, meeting supply chain representatives, policy makers, farmer organisations, farmer groups and researchers to understand the issues and suggest relevant solutions.



Chapter 4: Farming, Greenhouse Gas Emissions and Carbon

Under the Climate Change Act 2008, the UK is legally required to reduce greenhouse gas emissions across the UK economy by 80% between 1990 and 2050.

To do this, the UK government introduced a system of carbon reduction targets. Under this scheme the agricultural sector has a voluntary commitment of an 11% reduction on 2008 greenhouse gas levels by 2020 (DECC 2009).

4.1 Agriculture and Climate Change

“Reducing carbon emissions in a farming business makes sense on many levels” (Farm Carbon Cutting Toolkit). There is a link between emissions and resource use: by reducing emissions there are opportunities to reduce costs and improve efficiencies.

4.2 Agriculture’s contribution to global emissions

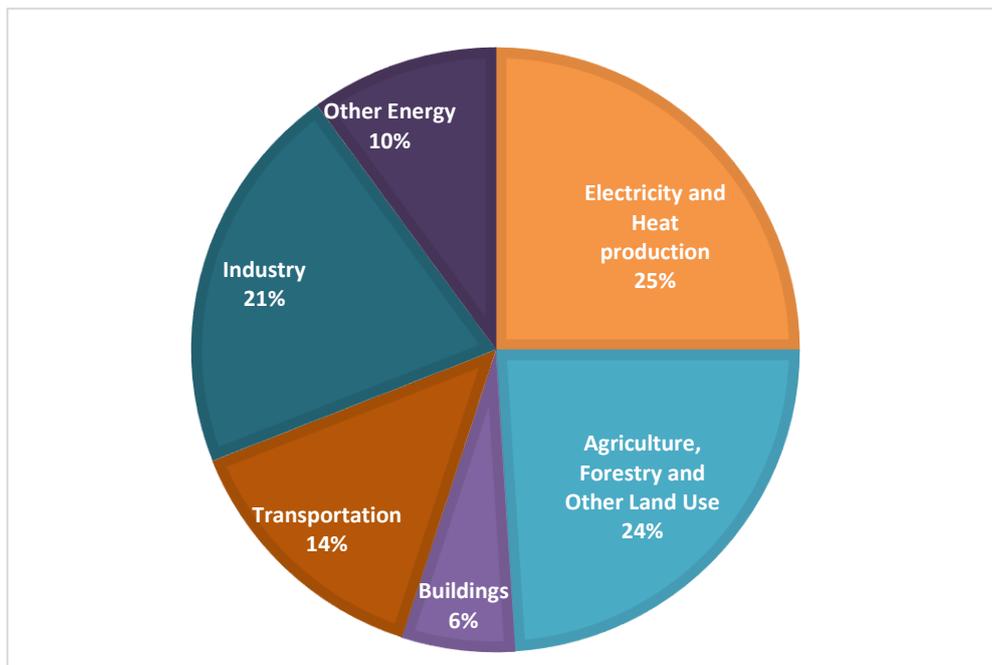


Figure 2: Global Greenhouse gas emissions by economic sector, (Source: IPCC, 2014)

Agriculture differs from many other industries in the breakdown of gases which make up its emissions profile. The most common GHG globally is carbon dioxide (CO₂), and so CO₂ is used as the reporting benchmark by which all other gases are measured (expressed as CO₂e). Within agriculture however, CO₂ represents a small proportion of emissions: the gases of more concern are nitrous oxide (N₂O) and methane (CH₄), which require concerted action to achieve reductions (see Table 1). However, farming is also unique as an industry in its opportunity to absorb (or sequester) carbon emissions from other sectors. Carbon dioxide is sequestered by trees, other woody biomass, growing plants and the soil. This gives farming and land management a vital part to play in ‘balancing’ the cycle of greenhouse gases in the atmosphere.



Greenhouse gas	Nitrous oxide (300 x more potent than CO ₂)	Methane (25 times more potent than CO ₂)	Carbon dioxide
Main sources on-farm	Manure Fertiliser use Soils	Livestock via rumen fermentation Manure storage	Fuel, Transport, Energy use, Land use change, Cultivation
Opportunities for reduction	Timing of fertiliser and manure applications Planning applications to meet crop requirements Soil management to avoid wet, compacted, anaerobic conditions Using legumes / reducing fertiliser applications	Optimising Feed efficiency Ration planning Improved Herd health Improved fertility Manure management Improved use of grassland	Energy efficiency measures Renewable energy generation Waste minimisation Reducing tillage Planting trees Soil management Reducing fuel use

Table 1 - Main GHGs from agriculture, common sources and mitigation opportunities

4.3 National policies and targets

The [Greenhouse Gas Action Plan](#) (GHGAP) is the principle mechanism for delivering agriculture’s commitment to a reduction in its annual emissions of 3 million tonnes (of CO₂e) by the third carbon budget (2018 -22) in England. It was developed in response to the last Low Carbon Transition Plan produced by the Government. It is an industry-wide initiative, whose steering group includes representatives from science, levy bodies, farmer lobby groups, and others who all work together to help farmers and growers mitigate and adapt to climate change, without compromising domestic production. The action plan focusses on how farmers, across all sectors and farming systems can become more efficient to help reduce greenhouse gas emissions and make cost savings per unit of production.

One of the key outputs from the Action Plan is the production of 15 on-farm actions that have been agreed as opportunities to encourage the continued reduction of GHGs from agriculture whilst at the same time increasing production efficiency (see Figure 3 for all farm types & Figure 4 for livestock farms).



Figure 3: Key Actions for all farm types
(Source: GHG Action Plan)

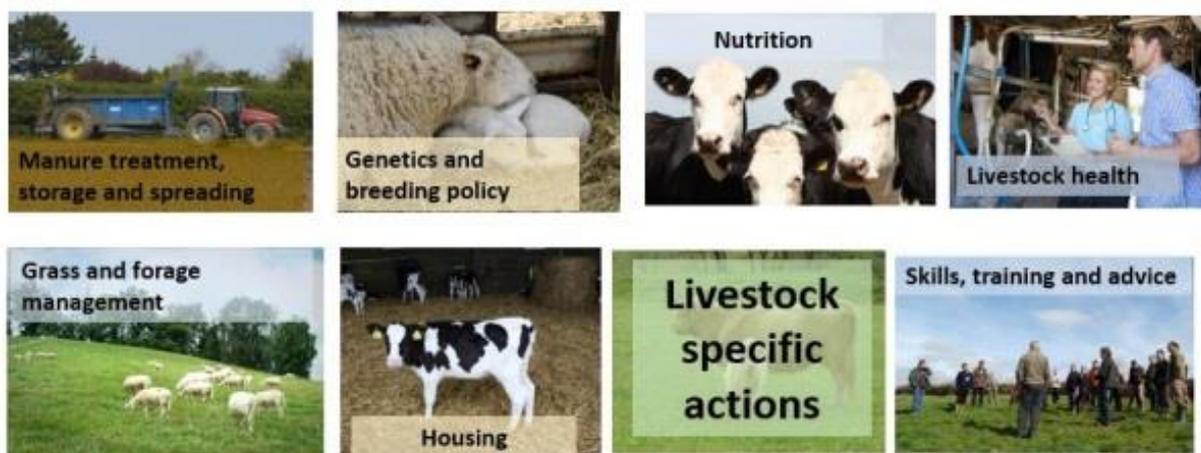


Figure 4: Key Actions for Livestock Farmers, (Source: GHG action plan)

4.4 Where next?

The Committee on Climate Change compiles targets and progress reports on how the different sectors are responding and looks at any policy recommendations or knowledge gaps that are preventing progress. The statistics show that progress by the agricultural sector is not on target. The latest progress report explains,



“Having declined for much of the past two decades, emissions increased for the second successive year to reach 49 MtCO₂e in 2014, up 2% on the previous year. The sector now accounts for a larger share of the UK economy wide emissions (9.5%) than at any time since 1990 (7.5%)” (The CCC, 2017).

This is a stark warning that the voluntary approach that we are currently using may not be around for ever as the farming sector is not on track to meet its projected target of 4.5 MtCO₂e by 2022. There is a pressing need for us to understand what methods work in terms of reducing emissions on-farm, and to engage the industry to start to deliver them, along with recommendations for new methods of calculating emissions, and developing new policies for forestry.

Key messages on policies and targets

The **time is right for action**. The current voluntary targets applied to agriculture may soon become mandatory.

It is a **priority to communicate** this message to farmers to allow them to understand the issues surrounding climate change and greenhouse gas emissions reductions.

There is a need to **promote farm management practices** that deliver the emissions reductions required, but also work in the context of sustainable business models. Sustainable farm practices must contribute to a farm’s economic and social wellbeing. The adage that “you can’t be green when you are in the red” has a fundamental truth to it.



Chapter 5: Science meets practice – methods to reduce emissions

5.1 Current research challenges

In the past, GHG emissions research has been focussed on the environmental benefits that arise from adopting certain management practices. Farms are business enterprises, and practices recommended must be financially viable, providing both income and improving natural capital to be sustainable and more importantly, adopted.

5.2 Engaging farmers in research

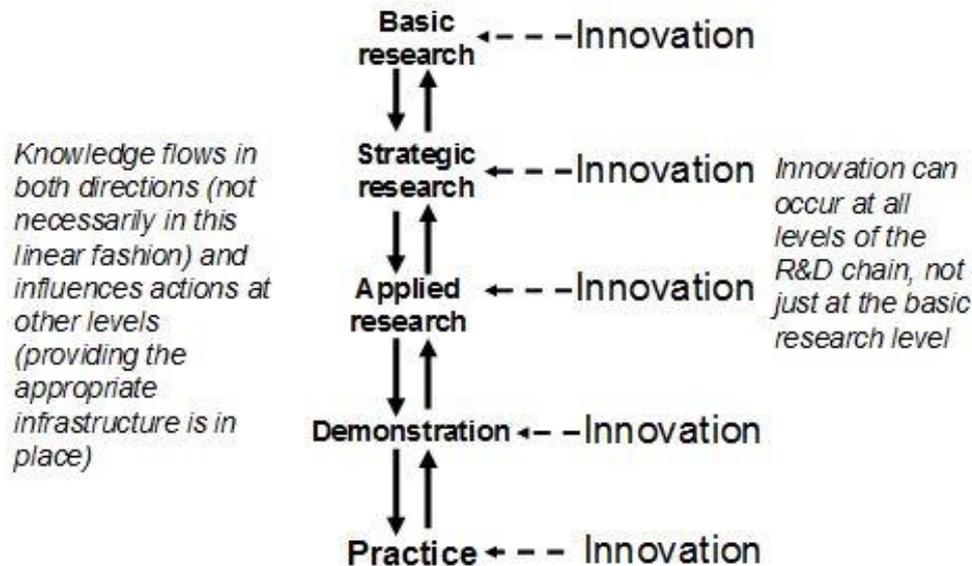


Figure 5: A fully operational R and D Chain,
(Source – *The need for a new vision for UK agricultural research and development*, Professor David Leaver)

There is a need to value farmers as major knowledge holders in the system. Terry McCosker, who works in Australia with farmers on grazing management and building soil carbon explains, “Traditionally there has been a reluctance by the academic community to accept producer experience as valid knowledge, maintaining the belief that good information can only come from replicated trials published in a journal.” By valuing and including farmers in the creation of research projects we will not only foster the relationship between science and farmers but we will start to bridge the gap between science and practice.

Knowledge exchange is a vital part of the process. The efficiency of getting the research to the end-user (and vice versa) and the way that the information is presented will directly influence whether the research is adopted on farm.

During my visits, I found good examples of this working in practice.

5.3 On-farm action: Farming for a Better Climate

The Farming for a Better Climate (FFBC) initiative is run by the Scottish Rural University College (SRUC) on behalf of the Scottish Government and provides practical help and advice to Scottish



Figure 6: farmers at an on-farm beef event, Grantown on Spey, July 2016

farmers to improve their farm performance and resilience to future climate events. Working from a body of academic research and on-farm results, the project focusses on five key areas to consider where emissions can be reduced without any loss of productivity. Now in its second phase, the project runs climate change focus farms. In the first three year round, all farms reduced their carbon footprint (assessed through SRUC's AgreCalc footprint tool) and made savings of around £20,000 per farm.

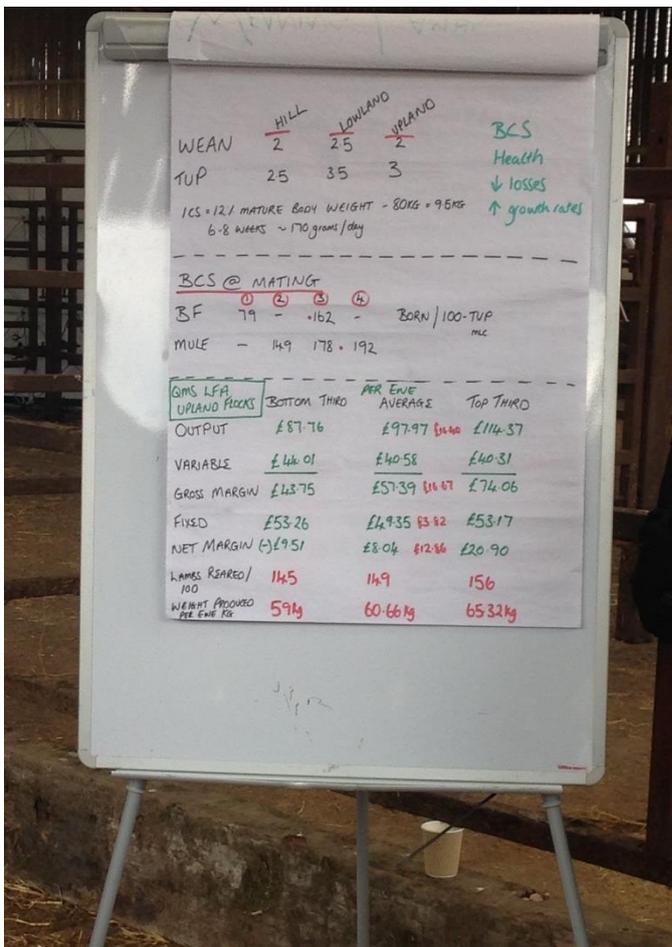


Figure 7: Communicating science on-farm, demonstrating economic, efficiency and environmental benefits of changing management,

The great benefit of FFBC is the opportunity for farmers to see what works at farm level, understand the benefits of different strategies to reduce greenhouse gases and also assess the financial impact (or savings) that come from implementing these practices. They can also talk to the host farmer about the practicalities, and discuss what would work on their farm.

Project co-ordinator Rebecca Audsley explained that the success of this approach is evidenced by the number of farmers that come along to the meetings (see figure 6). Her research suggests farmers value having a number of specialist experts who come on-farm, as well as the input from other farmers. These meetings are only open to farmers, and project staff are very much present only in a facilitation role, helping farmers get the most out of meeting. The project develops case studies that explain the management options and financial implications in more detail and use other media opportunities to help communicate

the key message, working with research to develop practical and profitable ideas to reduce farm carbon footprints.



Figure 8: Case study publication from Climate Clever Beef

5.4 Climate Clever Beef, assessing potential and driving policy

Climate Clever Beef (led by the Department of Agriculture and Fisheries in Queensland), collaborated with beef businesses in six regions across northern Australia to better understand the links between greenhouse gas emissions and carbon stocks, land conditions, herd productivity and profitability. Current performance of each business was measured and alternative management options were identified and evaluated.

Farms were set up as research stations and worked on issues that were pertinent to the farm business to evaluate the carbon impact. The project brought policy makers out onto farms to talk with farmers and scientists, see action at farm-level and understand where the trade-offs might be.

One of the trade-offs that has been looked at through the Climate Clever Beef project is how to manage and control native woody species within pasture based systems. Stands of Brigalow forests have been extensively cleared for agriculture in the past, as by clearing the trees the quality of the pasture improves. However, there is concern about the loss of native habitat within these Brigalow systems and the impact on carbon and biodiversity from controlling these trees. There are



Figure 9: Woody regrowth and cattle at Coonabar, with Murray and Wendy Gibbons

opportunities for farmers to sign up to the Emissions Reductions Fund and receive payments for the carbon stored within these trees. Murray Gibson is a local farmer engaged with the project to understand the carbon versus cattle trade off in more detail (see figure 8 & 9).

Research trials on his farm looked at the carbon sequestration potential of the regrowth, and also the impact on pasture quality of increasing the height and density of trees. Economic modelling as well as testing carbon sequestration rates, showed that *“ceasing clearing in favour of*

producing offsets produces a higher net present value over 20 years than existing cattle enterprise at current carbon prices.” (Gowen and Bray, 2016).

Embedding research on-farm was seen as a positive step by the Gibson family and gave them confidence in the results, as well as creating links with researchers.



5.5 Social science - the missing link?

As well as understanding the management practices and technologies that will help mitigate greenhouse gas emissions on-farm, another key part of the puzzle is how this research is disseminated to farmers in a way that inspires engagement. How farmers learn new things and what enables behavioural change are complex and multifaceted issues, but are incredibly important when looking at running effective knowledge exchange projects.

While in the USA I came across a project that was involving social scientists to start to understand in more detail what made farmers use new decision support tools. I was interested to understand more about how this could be used more within climate research and increasing uptake of greenhouse gas mitigation measures.

Randy Johnson, who was part of the team that set up the climate hubs for the United States Department of Agriculture (USDA), is the director of for Global Climate Change for the National Institute of Food and Agriculture (NIFA). I chatted to Randy about what he had found were the best ways to get farmers to change their management. His key message was, *“for every number (or statistic) you give, you have to tell a story.”*

Randy and his organisation provides leadership and funding for programmes that advance climate change science. The project that they have been funding is the Useful to Usable project (U2U), an integrated research and extension project working to improve farm resilience and profitability in the North Central US by transforming existing climatic data into **useable** products for the agricultural industry.



Figure 10: Natalie Umphlett and Crystal Stiles, climatologists from the High Plains Research Centre Nebraska working on the Useful to Usable project

tools on offer, and 2 million acres were being managed by people who had used the tools and made decisions based on the tool findings.

The goal of this project was to help producers in the U.S. corn belt make better longterm plans on what, when and where to plant. The role of the social scientists was to produce in-depth data on the actual impact and use of the tools that were created. This involved re-visiting farmers that had attended the training to use the prediction software and understanding in more detail how they were using it, and the difference it was having on their business.

Early project results suggest that 20% of farmers had an understanding of the

Involving social scientists allows projects an opportunity to understand in more detail how to frame research findings in a way which allows practical action, as well as being able to provide more meaningful monitoring data,. This skill of communication and dissemination is a very different skill from what is needed to be a good and diligent researcher. We need to ensure that as well as having



good science and scientists, we also have people who can translate that science into something that has meaning at the farm level. This involves an understanding of the social networks within agriculture, and how to facilitate appropriate methods of communication.

Randy explained, *“there are three ways you can get farmers to do something, you can regulate, incentivise or teach. By tapping into trusted networks, and understanding the social networks that exist, you make the job a whole lot easier.”*

Core research into future challenges and understanding new methods of reducing emissions is still incredibly important, but there is also a need for more projects that link researchers and farmers together to ensure that the science represents field and farm level issues and provides the information in a way that farmers can use it.

Randy emphasised the need for co-ordination of research and the inclusion of farmers within research projects. *“It’s got to be a team effort, and include co-production of knowledge: if you do that you are halfway there as you are all invested in the solutions. We can’t deal with this big stuff in isolation, we have got to co-produce and work together.”*

Key messages

In order for research to be effective,

We **must link science to practice**, measures have to be rooted in core science but actionable on-farm, and include an understanding of the wider business impacts of changing management (including cost savings and time requirements).

There must be a **transition from telling to showing** using on-farm research sites, including using farmers in generating solutions. These farm sites can be used to demonstrate efforts to policy makers and consumers.

Science and field based projects need to involve insights from social sciences about how best to engage, involve and encourage behavioural change within farming communities.



Chapter 6: Metrics and models

“One of the great challenges in addressing the greenhouse gas emissions from agriculture is access to data and information on-farm that can help drive improvements.” (Dr John Kazer, the Carbon Trust 2016).

6.1 The importance of carbon footprinting

Reducing carbon emissions and increasing carbon sequestration can have a significant effect on the profitability of farming. The problem is how to measure the changes and then how to translate those into a measure of profitability. There is an inherent variability in agricultural emissions and carbon stocks due to the intricacies of biological systems and the impact of climate, soil type, topography, and vegetation from region to field scale. This variability results in a high level of scientific uncertainty and makes measurement problematic. However, metrics are something that are fundamental not just to identifying solutions, informing research and driving technological change but also to providing a way to document the impact of efforts.

All this uncertainty and complexity can mean that the process seems daunting to farmers and far removed from day to day business management. However, the often overlooked principle is that at farm level, carbon is just another lens through which to evaluate business efficiency.

6.2 Current standards and methodologies

National reporting and PAS2050

High level national reporting data does not provide farmers with the information needed to drive management change, or show how those changes in management are impacting (either positively or negatively) on their footprint.

The Carbon Trust has developed a life cycle analysis methodology for the UK called PAS 2050. This was written to create a consistent way of assessing the greenhouse gas emissions associated with the full life cycle of goods and services, from sourcing raw materials, through manufacture and distribution, to use and disposal. Supply chain carbon footprinting work is measured through this standard, and although it is an important step towards a consistent methodology useful to farms, it takes no account of soil carbon sequestration on-farm.

6.3 Farm Level footprinting

Farmer engagement with voluntary on-farm carbon footprinting is limited. There are practical issues which have frustrated interested farmers. These include compatibility of footprinting tools with each other (it is not possible to compare footprints that have been calculated using different footprinting tools), time for the user to input farm data to the system, the user interface, and whether the footprint calculator being used includes soil carbon sequestration or not. The other issue that often arises is the interpretation of the footprinting result in a way that has meaning to the business and informs the user what to do next.

These were issues I was keen to investigate during my travels and meetings with organisations who are involved in supply chain footprinting.



6.4 Integrating metrics with delivery



Figure 11: COMET-Farm team, Mark Easter, Dr. Keith Paustian, and Amy Swan, Colorado State University,

At Colorado State University I met with Mark Easter and his team who work on the COMET-farm tool, a whole farm and ranch planning programme that can be used to assess GHG balances across operations. The calculator works using the DayCent model, which is the same model that compiles the GHG inventory that the USA uses to report its emissions to the United Nations. As such there is a consistency of methodology across different scales.

As well as the full footprint programme there is COMET-planner, a tool used by Natural Resources Conservation Service

(NRCS) agents who are out in the field helping design programmes and activities that farmers can engage in. COMET-planner allows for scenario planning and helps look at the impact of changing management on greenhouse gas emissions. A farmer may meet with their local NRCS agent to find out about the opportunities in terms of grants and programmes, and, while they are discussing options, can appreciate the co-benefits (including carbon) that may occur from this change.

COMET- planner has also been used to inform the USDA about what management practices should be supported through programmes as it allows an understanding of the impact in terms of GHG emissions of farmers adopting different practices. COMET-planner has in addition been used to help shape programmes that support the planting of cover crops and a reduction in tillage, allowing farmers to appreciate the carbon and emissions benefit of these practices alongside agronomic impact.

6.5 Efforts of the Supply chain

The supply chain has been making considerable effort to engage farmers in environmental reporting. Supermarkets, as part of their Corporate Social Responsibility strategies, in relation to reducing their environmental impacts have to be shown to be working throughout the supply chain: footprinting their suppliers is part of this strategy. During my scholarship I spoke to three organisations that hold supermarket contracts within the UK for completing farm carbon audits and reporting for supermarkets, Alltech – ECO₂, AB Sustain and Promar.

Tom Gill, Head of Environment at Promar explained the potential for integration and the value of using the supply chain, *“It is fundamental to get the supply chain involved. Bottom up approaches will only get you so far, there needs to be agreement all the way up the chain. Traditionally of the three pillars of sustainability (economic, environmental and social), economics was a dirty word, however the economics is the way that you make it meaningful to agri-business. This is where the supply chain has been the beneficial lever, and where metrics and data can be used to highlight these multiple benefits.”*



There is an opportunity to use this supply chain audit requirement to have a meaningful discussion and to help farmers understand the issue. This requires the right people to be out on-farm carrying out the audits.

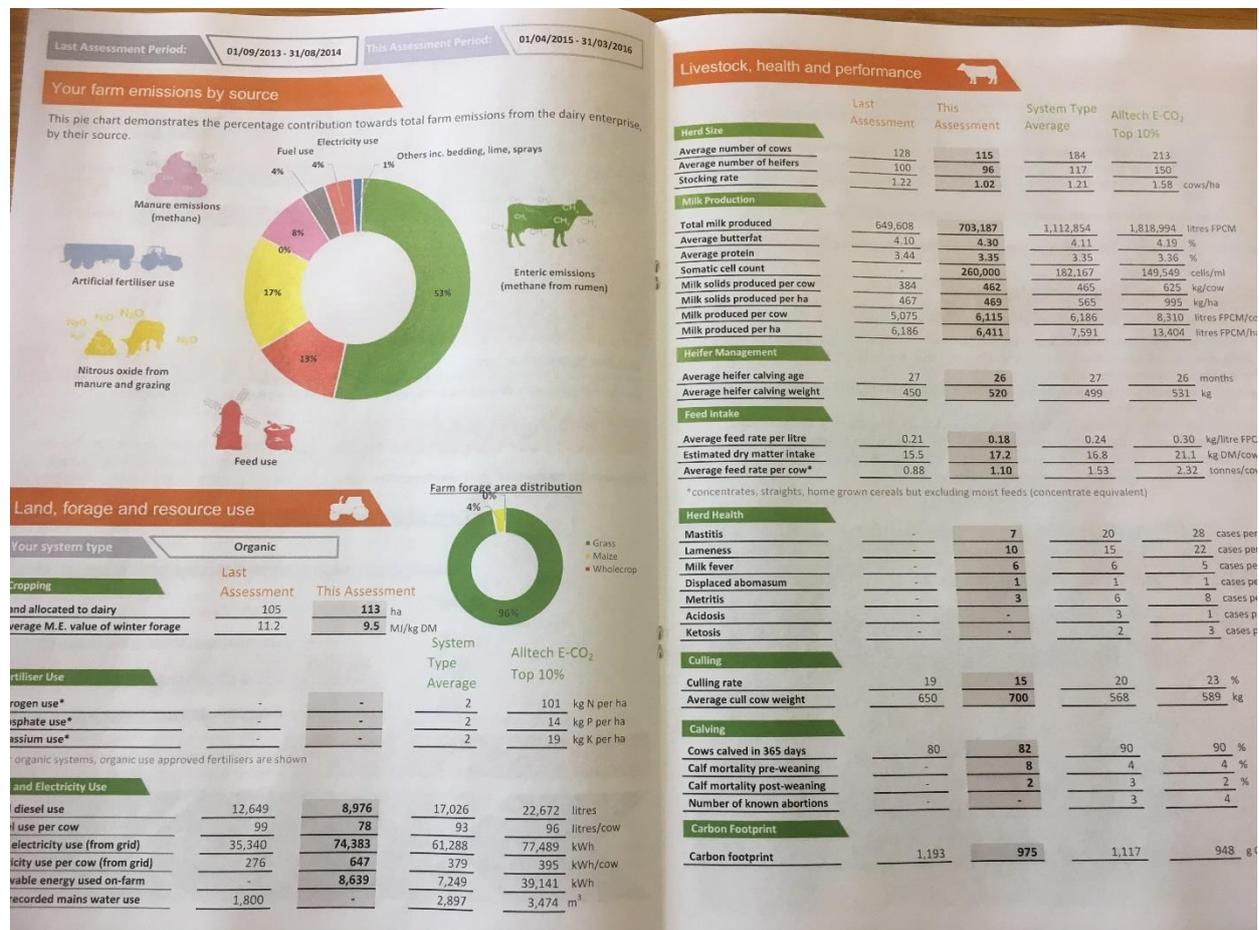


Figure 12: An example report from Alltech E-CO₂ that breaks down emissions sources (left hand page) and shows the performance of the farm compared to the top 10% performing herds and the average.

Positivity, practical knowledge and people skills are all fundamental qualities that Alltech E-CO₂ value in their assessors. Chris Davies technical manager at Alltech E-CO₂ explains their strategy, “Having the right people allows the advisor to build a relationship with the farmer, to understand and empathise with frustrations but highlight the positive benefits that come from going through the footprinting process and the opportunity to analyse business performance.”

“We have found that having assessment staff from an agricultural background with some first-hand knowledge of farm-life really helps to build rapport when collecting data, and by training staff to be able to point out realistic improvements that can be made when walking around the farm means you are adding value to each business you visit, not just taking data away with you”

6.6 Case study: Using the Cool Farm Tool with poultry producers in America

The [Cool Farm Tool](#), which was originally developed by the University of Aberdeen, is a calculator that can be used individually by farmers but is also endorsed and used internationally by companies and supply chains to evaluate the impact of operations. One project that researchers from Aberdeen have been involved with is using the tool to work with organic egg producers in America to reduce



their carbon footprint. Researchers worked with 10 egg suppliers (producing over 50 million dozen eggs) over three years. Each farmer received training and support in how to use the tool to self-assess their footprint and then they met up as a group three times over the three years to discuss progress and what practices they were going to change.

Some interesting points emerged:

- All farmers tried new management strategies, including looking at feed sourcing and rations, and transport, and as a result over the three-year project there was a 14% reduction in greenhouse gas emissions.
- From the farmer's point of view, the value came not from completing the footprinting exercise but from the workshops that brought the producers together. The value was on the learning rather than the data. However, the paradox is that the process of completing the footprint and getting that number, gave them a framework for discussion. Using the tool was the trigger that got them together, but it wasn't the key stimulus as identified by the participating farmers.
- Following the project (which finished in 2014), none of the farmers have re-used the tool, but they were all keen to meet up and have another workshop and continue the discussions. The real value to the farmers was in terms of supporting management changes, but for the supermarket the value was in relation to quantifiable changes in carbon footprint and the opportunity to market a success story.

Key messages

To get wider voluntary take up of farmer's carbon footprinting and to get farmers to see the value in completing it, **there needs to be a consistent methodology and reporting framework** which will allow for comparison between tools, as well as steps to integrate footprinting software with management packages.

Metrics and reports **need to be tailored to the individual farm business** to make them meaningful.

There is a need to develop **opportunities to use benchmarking** to show farmers where they are currently and the potential in the future.

The importance of people. No matter how innovative or sophisticated the footprinting software is, you need people to sell it and tailor it to a farm business. This involves skill from the assessors to understand the drivers and motivations in a farm business and to tailor the results to talk about carbon in the language that makes sense to the farmer.

Metrics by themselves do not equal behavioural change, they allow for impact reporting.

To develop tools that are genuinely used on-farm and are seen to have value, there is a need to **engage farmers in the design process**.



Chapter 7: Supporting behavioural change: policies, penalties and payments

*“Would you rather go down a farm drive with a gun or a cheque?”
(Jeff Creque, Carbon Cycle Institute, California)*

7.1 Integration of climate change efforts into agricultural policy

“Unless policy reflects the effects of different management practices and sends appropriate signals to farmers it cannot drive practice change and tap agriculture’s significant mitigation potential” (King, 2010).

Policies that stimulate and accelerate wider adoption of sustainable farm practices have the potential to deliver significant mitigation and adaptation co-benefits. But there are certain aspects that need to be considered to achieve change.

a. A consistent and coherent policy position to support practices

The politicised nature of climate change was very evident when travelling in Australia. The main comments from farmers stemmed from the fact that as soon as the issue becomes political and something that is used as a ‘bargaining chip’, then it loses its credibility. When talking to advisors and project staff they thought that the overarching consistent political will was missing and this was what was needed to undertake some of the longer-term monitoring and support with farmers to achieve real practice change.

b. Streamline policies, and develop a flexible approach that integrates policy goals.

“When you engage the agricultural sector, you get multiple benefits, you are supporting rural economies, landscapes and people, as well as individual businesses” (Pelayo Alvarez, Carbon Cycle Institute, California)

The USDA’s Climate Hubs programme aims to integrate climate change mitigation efforts into broader conservation efforts. The Climate Hubs programme was set up to “deliver science based knowledge, practical information and programme support to make climate informed decisions in light of the increased risk and vulnerabilities associated with a changing climate” (USDA). The USDA have designed 10 building blocks for climate smart agriculture which the policy supports. However, what really stands out is the collaborative process that it is built on. The hubs include USDA, NRCS, the Agricultural Research Service, universities, extension providers and others and provide co-ordinated action which is adapted to regional conditions and priorities. This is then linked to funding (or cost sharing) for farmers to take up certain actions under these building blocks. By bringing everyone together round the table not only do you provide consistent messaging to farmers but you include everyone who is talking to farmers, which increases the chance of including all aspects in the discussion.



7.2 Green marketing, selling carbon

“To capture value at the farm gate we need to define the value in the farming system” (Neil Darwent, Free Range Dairy)

Adding value to products because of the way that they are produced is another opportunity to engage farmers in the carbon agenda. Initiatives like Ireland’s Origin Green, show a national commitment to producing goods in a sustainable way, and there are numerous other programmes that are looking at whether there is a market for goods that are produced sustainably. While one admires the leadership and pioneering vision of Ireland, what remains to be seen is how to take something from political aspiration to make a difference at the farm level. It is the same question that arises when looking at assurance and auditing schemes: how to turn something that has to be completed to get the ‘seal of approval’ into an opportunity to have a discussion about management on a meaningful level? This reinforces the importance of the people completing the auditing, their skill level and the trust that the farmer has in their knowledge and understanding of the issue.

Key messages

Policy is the golden thread which links research, tools, opportunities and risks together, but it **needs to be flexible and reactive** to address the challenges we are going to face.

Allowing farmers **flexibility and ownership** of projects allows for legacy and longterm change.



Chapter 8: Communicating Carbon

There is no getting away from the fact that communicating the issues around climate change and carbon management is tough. *“The issue is not straightforward,”* explains Professor Lorraine Whitmarsh who works for the School of Psychology at Cardiff University and the Tyndall Centre for Climate Change Research. *“Our prior beliefs about climate influence how we interpret experiences, so if we are already sceptical about climate change then we will not connect the effect with the cause.”*

Key conclusions from the recent World Symposium on Climate Change Communication indicated that *“the challenge today is not technological, the challenge is the quality of information; we can no longer provide general information, we need to provide actionable and site specific information.”*

8.1 Communicating science

It is recognised by the academic community that communication plays a key role to enable practitioners to access science. Climate science and its terminology can be very technical and dry, as such there is a need to make it accessible so as to achieve increased engagement and understanding.

8.2 Language

The language that is used to communicate climate change makes a big difference. There is a need to breakdown the complexity and to use language that has meaning to the end user, and can be understood.

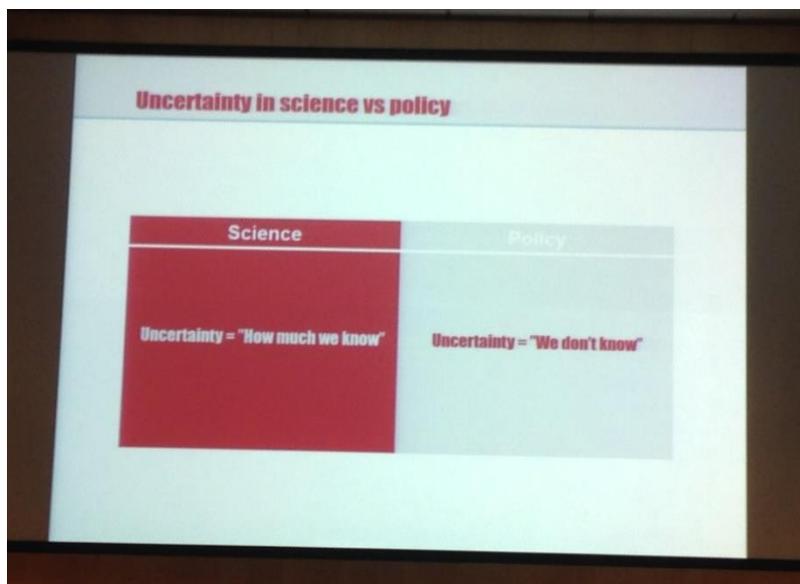


Figure 13: Presentation slide detailing the use of language in communicating climate change, from IPCC presentation, World Symposium on Climate Change, February 2017

8.3 Case Study: Graeme Anderson, the Climate Dogs

Graeme Anderson from the Department of Primary Industries for the State of Victoria is a climate extension specialist. His job is explaining the complexities of climate forecasting to farmers and helping them understand what impact these models will have on their management decisions.



Enso rounds up tropical moist air in the Equatorial Pacific Ocean

Indy delivers moisture from the Indian Ocean

Figure 14: Two of the climate dogs from the award winning animation. (Source: Agriculture Victoria)

Graeme has used videos to try and explain these complex climate models to farmers. The different weather patterns are characterised by a cartoon dog, and each video depicts a dog (all named after the acronyms of the weather pattern) behaving in a way that the climate does when these conditions occur. The videos also explain the impact that these models bring in terms of rainfall and temperature patterns.

He provides monthly climate forecast videos that are done in the style of a spoof sports programme with lots of humour. This use of humour and creativity ensures

they are shared more on social media and reach a wider audience.

Graeme has also produced short videos that explain the complexities of climate science, soil carbon and adaptation and mitigation options open for farmers which are designed for advisors as part of a CPD programme. He is well liked by the farming community and respected, he regularly speaks at events about climate patterns and models (rather than directly about climate change and carbon) and attracts large numbers (his last event had 1,000 farmers at it). Graeme explains, "by understanding the climate patterns, farmers are able to make informed decisions on farm management and improve business resilience."

8.4 Framing the issue



Figure 15: Poster at Pennsylvania Association of Sustainable Agriculture conference, February 2017

Psychological research has looked at the issue of climate change and started to unpick some of the reasons why people do or don't engage in action. One of the only consistent conclusions that has come from studies trying to find relationships between variables is that political view influences whether someone believes or acts on climate change. As such, there is a need to frame the issue in a way (i.e. a non-political way) that the person / group that you are trying to communicate with is more likely to listen.

Messages need to be framed in a way which will make people respond rather than effectively 'preaching' to them about what they should do. Messages delivered by people that don't share our common values or we don't empathise with will not result in action.



8.5 Overcoming preconceptions

There is a need to remember that there are often preconceptions around climate change which may lead to a reluctance to engage. How the mass media covers scientific subjects matters in many ways (Boykoff & Rajan, 2007). The media plays an important role especially when looking at the often controversial topics of meat consumption, deforestation, environmental protection and the impact of agriculture on the environment. Weingart et al (2009) explains *“media coverage has helped to shape public perception and through it, has affected how science is translated into policy, most notably in regards to the environment, new technologies and risks.”*

As well as the media shaping the public perception around climate change, it also means that when advisors, researchers and extension agents are talking to farmers and getting them engaged in mitigation efforts, it is important to remember that there are often preconceptions which may lead to a reluctance to engage. Breaking down barriers, communicating with the media to promote the good news stories and providing consistent messages that inspire confidence are all strategies that need to be embedded into projects to achieve action.

New methods of communication, including social media, offer good opportunities to promote the good news stories. However as an industry there is a need to answer some of the ‘tough’ questions on meat consumption and environmental impacts.

8.6 The use of values in communication to empower action.

The factors that motivate environmental concern in humans originate in our values and goals. They may not be the most important factors in any one decision, but research suggests that values emerge as one of the most important motivators of action on issues (Maio, G. 2011, Common Cause Communication booklet pg 21). This work on values and the use of values to engage people in action is championed by Tom Crompton from the Common Cause Foundation in the UK. He explained

“If you accept that some of the most pressing challenges that society confronts can only be addressed in the context of widespread public demand for change, then you simply must put an understanding of values at the forefront of your work.”

This means that for climate change communication, framing the work in terms of intrinsic values should be more effective in getting people to take action.



Farmers whom I visited, who had changed management, cited intrinsic values as core motivators. Derek and Kirrily Bloomfield, beef farmers from Australia explained *“managing land in the extremes of weather while profitably producing food isn’t always easy, but we’re doing our best to leave things better than when we took over.”*



Figure 16: Derek and Kirrily Bloomfield, Australian Beef farmers direct marketing their holistic production system under the brand “The Conscious Farmer”



Figure 17: Charlie Arnott, Farmer from Boorowa, New South Wales

Charlie Arnott, another farmer from Australia, explained his business strategy, which was rooted in a desire to *“work with nature to restore landscape function and to develop a business that is genuinely sustainable in terms of the natural environment, providing a stable source of income and a resource for the local community in terms of creating a vibrant place to live.”*

The use of values in communication is an important tool to help farmers (and wider society) change practices and behaviours in response to climate change.



8.7 The issue of scale

The main problem with delivering action on climate change is that it is a distant issue for most people, and (especially in the UK) we will not experience the fuller direct impacts of climate change until later in the century. The distance from threat means that people are more likely to ignore the issue; often they make decisions and alter behaviour relating to things that are in the here and now, rather than in the distant future.

A common belief is that also does one person changing their behaviour make enough of a difference or is it a drop in the ocean? This is where engaging with communities and working collectively can make all the difference.

Another issue is that even though climate change is a problem and it is global in nature, the impacts are local. As such, when communicating the potential impacts of global temperature rise the impacts need to have value at the local level. There is a need to find ways to admit the problem exists, that it is global and serious, but also to find a way to bring it back down to the local scale to look at what actions are possible here and now.

8.8 Case study: '10,000 actions' The University of Manchester, small steps, big change.

The University of Manchester developed an innovative project for their staff entitled '10,000 actions'. The project is about encouraging every member of staff to take a small action personally which, when added together makes a big difference. It consists of a learning and action programme, where staff sign up, learn about the sustainability issues and solutions in six key priority areas for the university, (the living campus, responsible purchasing, travel, energy, water and waste) and then select an action that is relevant for them that they then complete. Their progress is tracked and achievements are celebrated. This initiative starts to develop a solution for an often voiced reason for non-engagement – what difference can I make? The solution is backed up by staff engagement, which has risen from 3% previously to 40% under this project. Changing small things on farm that can be reported collectively across the industry is a key strategy to encourage engagement.

8.9 'Climate hell doesn't sell' – making it positive

To get people to engage requires a positive narrative. Linked to the comments above about preconceptions and prior beliefs, telling positive stories and celebrating achievements in carbon reduction will help to inspire others to act rather than driving fear and uncertainty.

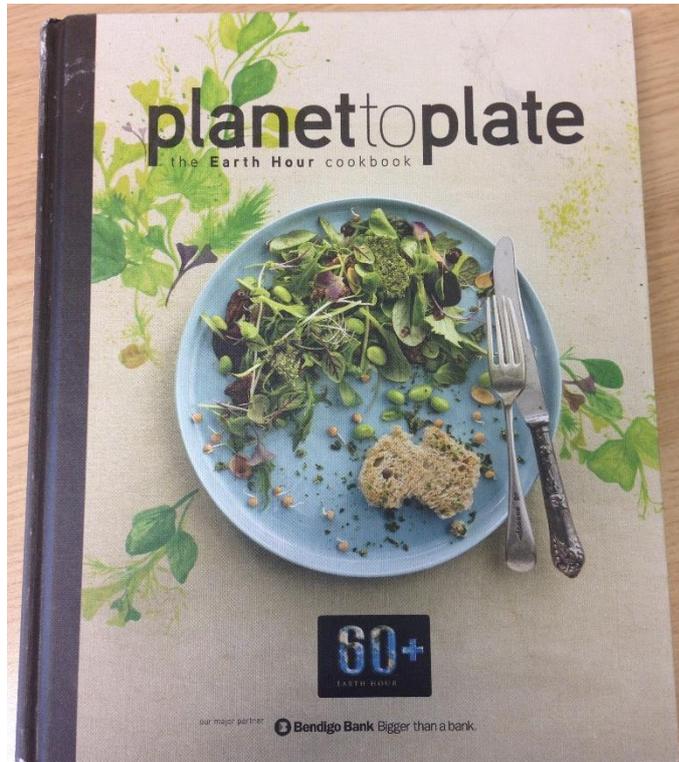
There is a need to stand up and defend the industry and demonstrate the good work that is going on, as well as recognising the scale of the challenge and understanding that there is still a lot of work to do. Fear as a method of engagement is not sustainable and will lead to more mistrust and misinformation.

Initiatives such as the Carbon Cockey awards in Australia allow the discussions about carbon mitigation methods to be framed in a positive way and celebrate achievement. The industry needs to be much more proactive in communicating the good news stories and using them to drive change. This goes hand in hand with informing consumers and policy makers of the potential within the agricultural industry to address these challenges.



8.10 Case study: Planet to plate – the Earth Hour Cookbook

While in Australia I met the human dynamo that is Anna Rose. Anna was manager of Earth Hour at WWF Australia and was awarded a Myer Foundation Innovation Fellow to focus on strengthening the diversity of groups involved in the climate change movement including farmers.



Anna wanted to engage with farmers and came up with the idea of running a creative project to talk to farmers about the threats that they were facing from climate change.

Figure 18: The Planet to Plate Cookbook

She explains,

“instead of farmers always being perceived as the bad guys, and the ones that were contributing to climate change, I looked to have the conversation the other way around, how is the changing climate impacting on food and farming.”

She reached out to farmers on social media and created the Planet to Plate cookbook which brought together producers, celebrity chefs and scientists.



Figure 19: An example from the Planet to Plate cookbook, including scientists, chefs, and farmers

“The six month process of working on something together that was directly related to the farm, got them involved. The process of putting it together and doing something creative brought farmers together and gave people a chance of being involved in something positive that showcased the great food that they were producing.”

The farmers that were involved, enjoyed being part of a creative process and on completion wanted to continue to work together and maintain momentum. Farmers for Climate Action was formed after the cookbook was finished.

Looking at all these examples shows how using different methods of engagement, including thinking ‘outside the box’ and using creative projects, along with framing messages in a way that speaks to farmers’ intrinsic values, allows for wider engagement.

Key messages

Achieving action requires a positive narrative.

Working together, being creative and sharing ideas of what works in terms of communication will **enable progress** for all industries. Although we are dealing with different technical issues, how we communicate them to achieve change is a common problem.

Language, message and framing are all vital components of communication

Translation of science into an understandable and actionable format is imperative.



Chapter 9: Converting knowledge to action, achieving the elusive behavioural change

*“The greatest impediment to change is a lack of demonstrated success.”
(Sam Archer, Nuffield Scholar, 2008).*

9.1 Talking to farmers, what drives change?

As well as the challenges of getting farmers to engage with programmes targeting action on climate change or reducing emissions, once farmers do engage there is also the need to provide the resources and inspiration to do something different. What drives behavioural change is a multifaceted issue and is very complex. Talking to farmers around the world, what has motivated them to change management has sometimes been driven by economics, sometimes by personal beliefs, but often by a non-expected event (often weather or something in their personal life) which is the trigger to re-evaluate their management. Is it possible therefore to design and deliver training that achieves instant behaviour change?

According to Graeme Anderson, there are three components to achieving behavioural change that all need careful consideration when designing knowledge programmes and policy.

Proven technology – The management that is being suggested works! The technology or practice is known and proven to work. This is where demonstration farm projects, connecting science with practice and promoting farmers talking to farmers comes into its own.

Capacity – Does the farmer have the capacity to adapt management? This may be having the financial resources (which can be helped by developing policies and programmes which help fund practices), but also may be other aspects which are less easy to solve. Succession, land tenure, labour availability, personal circumstances, lack of suppliers and fit with current system can all be factors preventing change.

Headspace / Attitude – Is the farmer ready to change? Do they want to?! Are messages targeted to season, local priorities and business drivers? Understanding where the business is now including its current issues (which may come from engaging trusted advisors with an in-depth knowledge of the farm created over many years) and targeting messages and solutions that fit with the management aspirations of the farm and any practical considerations is a vital component. As well as suggesting measures that make sense to change for some benefit that the farmer values.

9.2 Engaging advisors – The Farm 300 project

The Farm 300 project was led by the Meat and Livestock Australia and funded by the Australian Government. The key objective of the project was to improve knowledge and skills of Australian livestock producers leading to a 10% increase in on-farm productivity and profitability and a 30% decrease in GHG emissions intensity.



This project instead of training farmers, trained advisors, and then allowed the advisors to adapt knowledge to local conditions that their farmers were facing. The process was new and innovative as it worked with advisors and then funded support and coaching programs developed by advisors and relevant to local need. The advisors task was to interpret research and turn it into regionally adapted programmes that would engage local producers.

Figure 20: Meat and Livestock Australia, Sydney

Farmers were given one to one coaching as well as the opportunity to benefit from farmer to farmer learning through peer discussion groups managed by the advisors. This use of coaching was explained by Irene Sobotta, Innovation and Project manager from MLA.

“Livestock farming is complex, coaching has been proven to be an effective method of developing farmer skills and achieving practice change at a systems level which is what we need.”

The continual learning through coaching allowed the farmers to build their skills and knowledge. This process allowed advisors to support their farmers over a longer time period and made the shift from training farmers once (for example at an event) to support them in an ongoing process.

The project also formed discussion groups. These had the overarching subject of reducing greenhouse gas emissions, but farmers set the topics they wanted to focus on, thus investing their time and effort into the scheme (as with the FFBC Scottish Initiative).

The overall objective was to improve the farmer’s skill level. By taking small steps and gradually working through the issues and by sharing experiences with other farmers there was an opportunity to gain inspiration as well as motivation to keep going. Indeed, the method was so successful for MLA that this method is to be rolled out across their other research strands.

Upskilling advisors in research and emissions reductions options and then allowing them the flexibility to build on their trusted relationship (often built over many years of giving them advice that works) with farmers to adapt generic research into something that has worth at the farm level is something that should be encouraged in the future. Equipping advisors with the most up to date knowledge about the subject (as in the Farm 300 project) so that they can suggest locally relevant mitigation methods and then facilitate, rather than lead discussions, should help achieve management change on-farm.



9.3 Farmer to farmer – collective action



The Champlain Valley Farmer Coalition is a farmer led organisation that was set up in 2016 to try to work together to protect water quality in Lake Champlain.

Figure 21: Chairman Brian Kemp at the Vermont Agricultural show

Brian Kemp, chairman explained *“We are a group of farmers in the Lake Champlain Basin who has taken a leadership role to show that farm economic resiliency and a clean lake can work together. We are primarily a farmer based corporation that exists to be a unified voice for farmers who are proactively addressing water quality.”*

As well as working together, a key remit of the organisation is to educate the public on efforts to protect water quality. This involves hosting school groups, holding farm breakfasts and open days for people to come along and meet the farmers and understand what they are doing. Practices that are



Figure 22: Meeting of the Champlain Valley farmer Coalition
(credit: Champlain Valley Farmer Coalition website)



being advocated include the use of cover crops, conservation tillage, minimising compaction and making buffer strips alongside watercourses to stop run off.

The group uses the University of Vermont extension team to leverage in research funding and to provide the secretariat function for the group, but apart from this, non-farmers are strictly by invitation only!

Membership of the group is growing rapidly, with 80 paid farmer members and more joining every week. Brian sees the value to new farmers as an opportunity to be mentored, to see these new practices working and to talk to farmers about the practicalities, *“extension is great, but as a farmer, you don’t change what you do until you see it working.”*

9.4 Developing networks that make a difference

Collective action provides a mechanism through which farmers can present a unified voice on issues that are impacting on them and create change. A great example of this was a group that I met in Australia called Farmers for Climate Action.



Figure 23: Farmers for Climate Action logo

Farmers for Climate Action are an alliance of farmers and leaders in agriculture who are working to make sure Australia takes the actions necessary to address damage to the climate. They explain *“We are determined to see farmers and agriculture get the support and investment it needs to adapt to a changing climate, as well as be part of the solution.”*

This network has worked with the Climate Media Centre to give media training to farmers and help them to see engagement with the media as a positive experience rather than a daunting one. This has allowed for increased awareness of the organisation and its remit, and has helped in terms of informing the public about the issues and what farmers are doing to change management.

Working together they have managed to engage the National Farmers Federation, become a member and get the policy position changed so that the NFF now *“recognises climate change and the challenge it poses to farmers and also recognises that we’re at the forefront of dealing with it.”*

9.5 Engaging the next generation

“Despite several decades of research on more effectively communicating climate change to the general public, there is only a limited amount of knowledge about how young people engage with an issue that will shape and define their generation” (Corner et al, 2015).

The Young Farming Champions initiative, Australia

Connected to the wider Art4Agriculture project is the [Young Farming Champions](#) initiative. The project identifies youth ambassadors and future innovators within agriculture. It provides training and mentorship to young people, allowing them access to knowledge within communication, marketing and professional development to promote positive images and perceptions of farming to a wide audience and inspire other young people to consider a career in agriculture.



The outcomes of this programme are impressive, over the last five years, the programme has reached over 120,000 students in schools, almost 1 million people through exhibitions and close to 1.6 million people through print, TV and radio coverage yearly.

Figure 24: Young Farming champions logo
(Source [YFC Website](#))

Two ambassadors that I met through Nuffield were Josh Gilbert and Anika Molesworth. Both [are](#) inspirational individuals that are dedicated to making a difference. A crowdfunding campaign raised enough funds to send them both to the Paris Climate Talks to engage and learn more and both are now incredibly active in promoting positive change with farmers (young and old) in Australia.

Josh explains *“I wake up every day committed to changing the narrative in Australian agri-politics, securing justice for Indigenous Australians, building resilient rural and regional communities and supporting and encouraging Australia’s farmers to embrace the challenges of climate change and move forward.”*

Engaging the next generation is crucial as is finding new ways to communicate, Anika is excited about the possibilities. *“Gen Y is an exciting generation— we have entrepreneurial flair, innovative spirit, and a desire to better the lives of those around us and across the globe. We have the capabilities and energy to revolutionize the face of food and fibre production to ensure a thriving sustainable future.*

We need a seat at the decision table to shake up the system, share our ideas, and help create the bright future everyone deserves.”

Key Messages

Empowering behavioural change involves a deep understanding of current knowledge networks and how to build on trusted relationships, as well as providing examples of demonstrated success to inspire others.

We neglect to involve young farmers and harness their creativity, energy and understanding of technology **at our peril.**

Farmers need to have the **skills, capacity and headspace** to be able to implement management changes.



Chapter 10: Soil Health and Carbon Sequestration

“Putting a value on carbon will mean for the first time ever, good land management will be financially rewarded. This can only be a good thing.”
(Terry McCosker, RCS and Carbon Link)

There is a growing recognition that in order to reduce high levels of atmospheric carbon we need not just to reduce emissions, but also sequester atmospheric carbon in the soil. Soils are a huge asset, as they can sequester vast amounts of carbon. This knowledge needs to be disseminated to practitioners on the ground who have the power to manage the land to improve or degrade the soil carbon pool. I could write a whole separate report on soil health and soil carbon, so this chapter just summarises some key points.

10.1 The Soil Health Movement

There has been an increased interest in the ‘soil health movement’, a global movement which aims to make agriculture more sustainable and profitable centred around a management philosophy based on four simple principles.



Figure 25: Principles of the Soil Health Movement (Source: Steve Rosenzweig)

Farmers that are interested in building soil health and changing activities are doing so independently and for a variety of reasons (including moisture retention, nutrient cycling, enhancing soil life, and improving the resilience of the business). This ‘revolution’ has been driven by farmers who are pioneering new ways of production that put soil health firmly at the heart of the business model. However policy is lagging behind practice. Farmers have often pushed beyond the replicated trials that advance science, their efforts are not being viewed as the results needed to develop new policy

*Communicating carbon reduction schemes to farmers;
busting preconceptions, driving efficiency and profit* by Becky Wilson
A Nuffield Farming Scholarships Trust report ... generously sponsored by AHDB Beef and Lamb



and support mechanisms. The challenge now is to understand how to build the soil health movement pioneered by these early adopters, to become more mainstream. Policy incentives, on-farm demonstrations and recognition of these early adopters will all help.

Soil health is a key solution to climate change as by building soil health, we achieve multiple objectives.

These include improved water quality, natural flood management, increase water holding capacity, improve plant and animal health, reduce disease and pest pressures and improve income in a sustainable manner. Soil health can be used as an integrative concept that helps farmers think holistically about their farm management and the environmental (and climate) impacts of its management. The interesting aspect of the initiative is that by framing messages around soil health, farmers understand the practical relevance and engage.

These farmer visionaries who ‘get’ soil health and are seeing results are the best advocates to inspire other farmers to change practice. Mike Kucera, Agronomist with NRCS in Nebraska explains, *“other farmers who have implemented practices are better advocates for soil health than a government agency”*.

Steve Rosenzweig explains – *“The possibility of a win-win for farmers and the environment is a driving force for the movement. One of the most unexpected outcomes of the soil health movement is that groups that were once fighting each other are now working together to achieve the same goal.”* ([Source: Ensia](#))

10.2 Payments for services – the case of soil carbon



Figure 26: Terry McCosker, Carbon Link and Resource Consulting Services

Terry McCosker has been responsible for a huge paradigm shift in Australian agriculture. Starting the Grazing for Profit school in 1989, his whole farm approach has revolutionised the way grazing is managed in Australia. For the last few years he has also been instrumental in helping Australian farmers navigate the carbon market. He has developed a methodology accepted as scientifically rigorous enough to allow farmers to be paid for sequestering carbon in farm soils. This has since moved to a newer version currently in draft form, using new technologies developed by CSIRO and tested at scale by Carbon Link. This new methodology also includes cropping practices.

In the UK, soil carbon is a fairly contentious issue. The science is pretty conclusive, in terms of the impact on carbon of land use change (arable – grassland – woodland). However, where there hasn’t been agreement is the impact of changing management; whether there is a link between no-till systems and building soil carbon, or whether if you practice rotational grazing or plant diverse pastures you are sequestering carbon at a greater rate.

When I asked Terry some of these questions he was completely clear on his position. *“There are two issues,”* he explained, *“firstly, farmers are way ahead of the scientists, in terms of what they are doing.”* He has farmer clients who (like in the UK) are seeing a complete revitalisation of their soils



by changing management practices. *“The soils are completely alive,”* he explains, *“the improvement comes not just in the increase in organic matter content, but also in helping the biology in the soil do what it was put there to do.”* Secondly the issue is that measurements are not at the correct depth. *“Most research stops measuring at 30cm, and the changes happen much deeper than that, we need to be measuring down to 1 or 1.5m to see the impact.”* He thinks that policy makers need to be more imaginative in how to support farmers who are innovating and doing new things whilst the established science is completed.

Carbon Link, (Terry’s carbon trading company) has spent the last few years working out how to translate erratic ecological processes into numbers that can be used in accounting software systems. They now have agreements and projects operational on-farms (18,000 ha baselined), where a lot of in-depth initial monitoring (at the farmer’s cost) is required, with no payment back to the farm until year 5, and farms are locked into 25 year agreements. I was keen to understand how farmers were recruited to a process when there is an inherent mistrust of the government and its policies.

Terry explained *“These farmers are my clients and they trust me. I’ve delivered results for them in the past. As such although it is still a big leap of faith in terms of investment and a level of trust in the policy systems they trust me.”*

An area of concern with soil carbon trading is that those farmers who are already looking after their soils and managing them in a way which builds soil health will not see the gains as readily as those who are farming on degraded land. However, what is important to remember is that there are multiple benefits alongside financial returns from soil carbon sequestration. The Fenner School at Australian National University, Canberra have calculated that although the carbon price is 12 AU\$ a tonne, the value of the wider ecosystem service benefits of that carbon is more like 200 AU\$ per tonne. As such carbon agreements may provide a favourable option for those who are looking to invest in farms, if they can purchase farms that have degraded soils, lock them into a carbon agreement and then use regenerative management to improve them, it could be a lucrative business model as well as having obvious environmental benefits.

10.3 Farmers focussing on soil health in Nebraska

While in Nebraska I was fortunate to spend two days with NRCS and the National Soil Survey Laboratory. The centre was founded by Dr Charles E Kellogg, who’s wise words are quoted outside the entrance to the lab, *“Essentially all life depends upon the soil.....There can be no life without soil and no soil without life, they have evolved together.”*

NRCS run soil health projects with the goal of reducing erosion and improving water quality. The programme is taking a view that by focussing on these aspects it provides a mechanism to develop resilient businesses, indeed by doing the right thing on-farm, the environmental benefits are also realised (a win-win). After water, the most limiting factor for these farms is carbon (not Nitrogen) as carbon is seen as soil organic matter, and the more soil organic matter that is there, the more water that you can hold.



A farmer championing the benefits of improving soil health is Del Ficke. A proponent of mob grazing, stacking enterprises and focusing on soil health, Del is pioneering a system of restoring soils. He explains,



Figure 27: Del Ficke and his wife in a field on their farm, Nebraska, USA

“Healthy soil is the foundation that productive and resilient agriculture depends on. When we focus on feeding out soils with living roots in the ground and cover above, our soils will behave just like they were designed to and act as living sponges that store water and cycle nutrients efficiently and effectively. By adding cover crops into your operation, you put yourself in a situation in which you are able to feed your soil and provide a premium forage for livestock, all while making nutrients available for your next crop. Time to farm smarter, not harder.”

His efforts were paying off. One of the things that helped him track the impact was that Del had always taken soil samples, so there was a baseline from which to measure. He has managed to improve his soil organic matter percentage in one field from 2.6% to 6.9% in a decade. As well as the benefits in terms of building soil, Del has also seen economic benefits, *“we are 70% more profitable in a holistic setting on a reduced number of acres than we ever were in the old system.”*



Figure 28: Digging soil pits in freezing temperatures on Del's farm, Nebraska

Del also shared his thoughts on how to help achieve behavioural change. He explained, *“if you are going to get people to change you need to show them the economics. But a desire to change has also got to be in your heart, if it's not there, there will never be a change. I can still remember the exact spot in the field where I was standing when I realised I wanted to do something different. It doesn't need to be complicated it often goes wrong when you think too much about it.”*

Throughout my travels soil health and efforts that farmers were undertaking to optimise management were a common theme. There is real opportunity to build on the soil health movement which is achieving genuine integration and use the momentum to achieve desired goals for carbon management and the climate.

Key messages

Soil health, an important factor in tackling climate change, is at the centre of resilient farm businesses and **offers an opportunity to talk to farmers about management and behavioural change** in a practical way.

The farmers who are driving the 'soil health revolution' **need to work with researchers** to provide data that is scientifically rigorous in order to start to recognise the potential from soil carbon sequestration.



Chapter 11: Conclusions

“The vision of success – Agriculture is efficient, competitive and climate-friendly. Very little biomass is landfilled, emissions are tightly controlled, and material formerly landfilled is used for renewable energy, compost and fertiliser” (DECC 2009)

1. This is the vision that was laid out in the Low Carbon Transition Plan by DECC in 2009. Having completed my travels, I am confident that this vision is achievable (practically and economically), however to transform the industry there is a need to work collectively to develop solutions.
2. Emissions associated with agriculture must be reduced. This is intrinsically linked with driving efficiency and realising economic savings. This requires consistent use of metrics that link the emission reduction potential with economic savings and make sense for farmers.
3. The potential around improving soil health and sequestering carbon within farm soils cannot be hampered by lack of replicated science. Agriculture is unique in its ability to achieve this, and there is an urgent need to connect research with the farmer innovators to develop the baseline data that is required to shape policy. Action is required on emissions reductions and soil carbon to achieve targets.
4. There is a need to engage widely, outside of traditional research circles, to include social scientists and communication specialists to upskill scientists and advisors in the commonly perceived ‘soft skill’ of facilitation.
5. There is a need to stand up and communicate the positive activities that are taking place within the industry, including the rising soil health movement and those farmers who are managing landscapes, reducing emissions and doing things differently. By encouraging positive stories there is an opportunity to inspire other farmers and celebrate achievements with policy makers and consumers.
6. Communication requires answers to some of the difficult questions concerning resource use, and the environmental impact of certain practices. Environmentalists and producers need to work together.



Chapter 12: Recommendations

For policy makers

The time to act is now

There is a need to develop policies that are rooted in science, integrated with current delivery mechanisms and are actionable at a farm level. Although the issue is complicated it must be broken down into simple, actionable solutions.

There is a need to prioritise funding for on-farm research and skills development to equip the industry to deal with the challenges ahead. Skills projects should be monitored in a flexible way to allow for real impact assessment.

A consistent carbon footprinting methodology that includes soil carbon and is practical at farm level is urgently required.

For the industry

Farmers need to be part of the discussion on carbon and climate change.

Soil health is of critical importance and is at the centre of profitable, resilience and sustainable farm businesses. We must protect it at all costs.

For projects and research

Farmers provide an invaluable knowledge source on what works on the ground. They should be co-creating research projects that fit industry needs.

Farming needs to be profitable; projects must not simply talk about emission reductions, the economic (as well as societal and environmental) benefits must be considered and documented.

It is crucially important to highlight positive stories and engage with farmers in a positive way.

People are vital, getting farmers to engage requires trust, positivity, practical knowledge and locally relevant solutions; training advisors in mitigation methods and facilitation will help to bridge the knowledge –action gap.



Chapter 13: After my study tour

The Nuffield experience has had a profound impact on my personal growth, development, knowledge and passion for UK agriculture. Stepping away from work, family and the safety of my comfort zone has meant that I have developed self-belief, confidence, and faith in my ability, as well as a passion to achieve real change and farmer engagement.

Working with the Farm Carbon Cutting Toolkit offers me a perfect opportunity to try some of these new ideas out in practice. Developing a Soil Farmer of the Year competition to champion those farmers who are safeguarding their soils has provided a fantastic opportunity to talk about carbon framed in a very positive way. We have engaged with farmers through the competition that we would never have met running a carbon event.

Following one of my key recommendations to achieve more consistency on the ground around soil carbon measurements and monitoring, a project is being designed in partnership with researchers, farmer organisations and farmers to measure soil carbon under different management practices. This consistent (robust) methodology should help to provide the much needed evidence required.

Travelling around the world through Nuffield has also allowed me to develop contacts and links with other organisations who are undertaking similar activities. These contacts will be used in the future to share knowledge across the world, and develop projects that have impact.

At Duchy, not only do I have the great privilege of being part of inspiring the next generation of farmers and innovators but I also have the opportunity to work at scale across the south west and evaluate different methods of knowledge transfer and skills development to see how we can evaluate the impact of training.

Looking at how we can embed sustainability and carbon into the curriculum and start the conversations early with agricultural students and young farmers can only be a good thing and I am committed to driving this agenda forward so that all agricultural students will leave college with an understanding of opportunities within the farm business to reduce emissions, improve efficiency and increase soil health and carbon sequestration potential.

Closer to home, I am using my position as chair of the community farm to start to discuss these issues with consumers, and evaluate where low carbon fits into the local food movement. Plans are underway to diversify and include broilers on-farm, an integrated project involving local schools as well as the wider community.



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Becky Willson



People that I met:

People	Organisation	Reason
Scotland		
Rebecca Audsley	Scottish Rural University College (SRUC)	Farming for a Better Climate Project manager, climate change focus farms
Gillian Reid	SRUC	Rural Business Consult involved in FFBC, and AgreCalc
Dr William van Dijk	University of Aberdeen	Postdoc researcher working on Cool Farm Tool
Dr Diana Feliciano	University of Aberdeen	NERC KE Fellow in understanding socio – economics in the adoption of sustainable agricultural practices
Dr Luiza Toma	SRUC Edinburgh	Reseacher into behavioural change
Joyce Campbell	Sheep Farmer	Using social media
John Gordon	Beef and Sheep Farmer	Achieving change on-farm
GACSA forum, Italy		
John Muldowney	Department of Food, Energy and the Marine, Ireland	Case study – Engaging Irish farmers in Climate Smart agriculture
Ludobiv Lardodiére	Department of Agriculture, France	Case study – working with farmers in France
Angela Falconer	Climate Policy Initiative	Finance options for Climate Smart agriculture
Fred Yoder	Farmer	North American Climate Smart Agriculture Alliance, working with farmers
Rose Akaki	Uganda National Farmers’ Federation	Issues in CSA in developing countries
Australia		
Irene Sobotta	Meat and Livestock Australia	Farm 300 project manager
Dinah Ardnt	Climate Media centre	Communicating and training famers to work with the media



Graeme Anderson	Department of Economic Development, Jobs, Transport and Resources, Victoria	How to deliver extension projects with impact to farmers
Jane Fisher	Department of Primary Industries, Policy manager	Using policy to achieve change
Anna Rose	Climate change campaigner	Engaging farmers for action
Mark Howden	Climate Change Institute, Australian National University	Research into methods that work, research gaps
Helen King	Researcher, Climate Change Institute	Achieving sustainable farming practices on-farm
Charlie Arnott	Farmer, New South Wales	On-farm action and working at landscape scale
Derek and Kirrily Bloomfield	Beef farmers New South Wales	Direct marketing, holistic management and on-farm action
Professor Richard Eckard	Director of Primary Industries, Climate Challenges Centre	Research into practice
John Ive	Sheep farmer, Yass Valley	On-farm action
Josh Gilbert	Young Farming Champion	Achieving change and engaging widely
Anika Molesworth	Young Farming Champion	Achieving change and engaging widely
Jacqueline Knowles	National farmers Federation	Policy change
Steven Bray	Queensland Department of Agriculture	Climate Clever Beef project
Murray, Wendy and Cameron Gibson	Beef Famers	Climate Clever Beef case study
John Dunne	Organic Beef farmer	Climate Clever Beef case study
Natalie Williams	Farmer and business entrepreneur,	Marketing opportunities, soil carbon Nuffield Scholar,



Ray Valla	Beef Farmer and Nuffield Scholar	On-farm action, making the most of grassland, rotational grazing
Terry McCosker	Resource consulting services & Carbon Link	Soil Carbon payments
Sam Anderson	Carbon Link	Soil Carbon payments
Louisa Kiely	Carbon Farmers of Australia	Soil Carbon
Tom Davison	Head of Research, Meat and Livestock Australia	Research gaps
Beverly Henry	Professor Institute for Future Environments, Queensland University of Technology	Research projects, research into action, designing on-farm trials
Sam Archer	Beef and Sheep farmer, & Nuffield scholar	Engaging farmers in environmental action
Ireland		
Mike Brady	The Brady Group farm business consultants	Carbon navigator and the Origin Green, achieving change on farm, using metrics
Anna Sexton	The Brady Group farm business consultants	Carbon navigator and the Origin Green, achieving change on farm, using metrics
Julie Roche	The Brady Group farm business consultants	Carbon navigator and the Origin Green, achieving change on farm, using metrics
Jane Rickson	Cranfield University	Including innovation and knowledge transfer, Cork 2.0 conference
Brendan Dunford	The Burren Project	Redesigning environmental programmes with farmer flexibility and ownership
Agnes Fiamma	Organic farmer, French Alps	On-farm action
America		
William Hohenstein	Director, Climate Change programme office, USDA	Climate Hubs and policy implementations
Rachel Steele	Hub Co-ordinator	Climate Hubs



Dan Lawson	Natural Resources Conservation Service (NRCS)	Climate Hubs
Randy Johnson	Director of Global Climate Change, National Institute of Food and Agriculture (NIFA)	Funding research that has on-farm impact
Joel Larson	USDA Climate change analyst	Climate Hubs
Joshua Falkener	Farming and Climate Change project co-ordinator, Vermont	Project implementation and engagement with farmers
Andy Jones	Organic Vegetable Farmer, Community Supported Agriculture	On-farm adaptation
Lorenzo Whitmarsh	Dairy farmer Vermont	On-farm adaptation
Sam Dixon	Shelburne Farms, Vermont	Sustainability on-farm education centre
Brooks Miller	North Mountain Pastures Farm, Pennsylvania	Redefining metrics for grass based systems
Franklin Egan	Education director, Pennsylvania Association for Sustainable Agriculture	Redefining metrics for grass based systems
Gabe Brown	Farmer, North Dakota	On-farm action and results
Brian Kemp	Champlain valley Farmer Coalition, Vermont	Farmers working together for environmental protection
Mark Easter	Natural Resource Ecology Laboratory, Colorado State University	Metrics and COMET-farm
Amy Swan	Natural Resource Ecology Laboratory, Colorado State University	Metrics and COMET-farm
Professor Keith Paustian	Natural Resource Ecology Laboratory, Colorado State University	Metrics and COMET-farm



Matt	Natural Resource Ecology Laboratory, Colorado State University	Metrics and COMET-farm
Mike Wilson	Lead on Climate Programme, Research Scientist, NRCS, Nebraska	Soil health, designing and delivering on-farm programmes
Mike Kucera	Soil Health Agronomist, NRCS, Nebraska	Soil health, designing and delivering on-farm programmes
Larry Dedic	Arable Farmer	On-farm action and engaging widely
Terra Vaverka	Arable Farmer	Use of cover crops
Don Jirsa	Cattle farmer	Rotational grazing and use of cattle to graze cover crops
Del Ficke	Beef farmer	Putting soil health at the centre of management
Paul Jasa	University of Nebraska Rogers Memorial Farm,	Using research to drive behavioural change
Brian Fuchs	Climatologist, National Drought Mitigation Centre	Helping farmers implement climate patterns into management plans
Natalie Umphlett	High Plains Regional Climate Centre, Nebraska	Using climate science to develop management tools for farmers
Crystal Stiles	High Plains Regional Climate Centre, Nebraska	Using climate science to develop management tools for farmers
Justin Malan	EcoConsult, Sacramento, California	Policy drivers
Pelayo Alvarez	Carbon Cycle Initiative	The Soil health initiative and encouraging soil carbon sequestration with farmers, knowledge transfer opportunities.
Torri Estrada	Carbon Cycle Initiative	The Soil health initiative and encouraging soil carbon sequestration with farmers, knowledge transfer opportunities
Jeff Creque	Carbon Cycle Initiative	The Soil health initiative and encouraging soil carbon sequestration with farmers, knowledge transfer opportunities



Crystal Powers	Communication and extension specialist, Nebraska	How to engage farmers with projects – what works and what doesn't
England		
Dr Ceris Jones	Climate change lead, NFU	The Greenhouse gas action plan and achieving action on the ground with farmers
Dr Lorraine Whitmarsh	Psychologist, Cardiff University and Tyndall Centre for Climate Research	Communicating climate change
Chris Davies	Head of Technical Development Alltech E-CO ₂	Metrics and supply chain footprinting
Imogen Cooke	Farm Assessor, Alltech-ECO ₂	Metrics and supply chain footprinting
Tom Gill	Head of Environment, Promar International	Metrics and supply chain footprinting
Nick Davies	Agriculture manager, AB Sustain	Metrics and supply chain footprinting
Dr Tara Garnett	Food Climate Research Network	Food policy, where are the links?
Laurence Smith	Climate Change and sustainability researcher, Organic Research Centre	The organic perspective
Indra Thillainathan	Committee on Climate Change	Policy and targets
Professor Walter Leal	Hamburg University	World Summit on Climate Change Communication
Adriana Valenzuela	United Nations Framework Convention on Climate Change (UNFCCC)	Action for Climate empowerment
Gretta Pecl	University of Tasmania Australia	Using citizen science to engage communities



Caroline Enquist	United States Geological Survey	Skills to help scientists communicate
Lucy Millard	The University of Manchester	10,000 actions project
Anja Hansen	Leibniz Institute for Agricultural Engineering and Bioeconomy, Germany	Using games for knowledge transfer
Tom Crompton	Common Cause Foundation	Using values to empower action
Jonathan Lynn	Head of communications, The IPCC	Communicating complex science
Chris Jones	Organic Farmer from Cornwall	On-farm action and metrics



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