A Trehane Trust Award

Ruminant Agriculture and Climate Change

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1.0 Introduction

Live like you will die tomorrow... farm like you will live forever!

Let's get something straight...I am not a tree hugger! Now that is done, I am married to Sarah and have two daughters, Jess and Aimee, who have all been patient and supportive enough to allow me to combine my hobby and my career. At the time of initiating this study I was Head of Research and Development for DairyCo (formerly the Milk Development Council), the role where the subject of choice from my Nuffield study emanated. During and largely influenced by the study, I made the (scary) decision to leave DairyCo and establish my own livestock consultancy business. A major aspect of my work now focuses on seeking knowledge and identifying opportunities for the agricultural sector to be part of the solution to climate change rather than a cause.

Five years ago when speaking with dairy farmers about environmental issues as a whole, I was often given short shrift, and this saw limited interest in investing levy funds in new knowledge for this area of work. Now I regularly have dairy farmers, their representative organisations and supply chain parties contacting me on environmental issues, predominantly related to climate change.

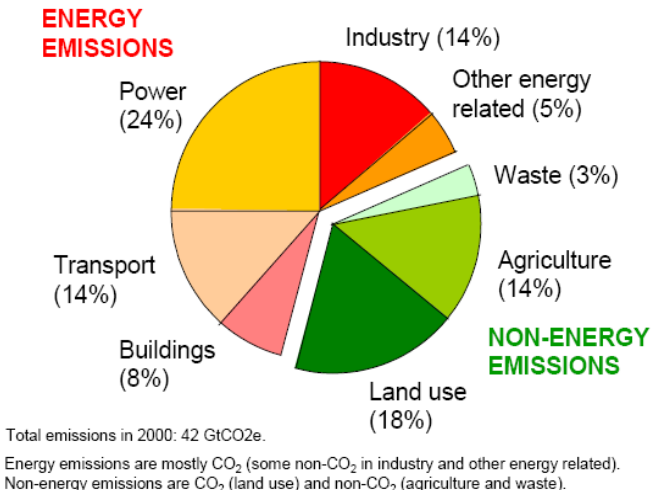
The climate change challenge is integral to all that we do in cattle farming, so having the opportunity through a Nuffield Farming Scholarship to focus on the subject was an extremely exciting proposition. My gratitude goes to both Nuffield and The Trehane Trust, for their faith in me to deliver this study. I would also like to very much thank my wife Sarah and two of my best pals (daughters), Jess and Aimee for continuing to support and understand me being away from home even more than usual. The standard line in the house over the Nuffield study period was...'Where are you this week'? Thanks Guys!

The opportunity this study has provided me with is immense. People that I was able to meet on this adventure, I not only call acquaintances but colleagues, as many of the initiatives that I am now engaged with in my brave new world involves me working on an international basis and working closely with these influential people, which I find both fascinating but hugely motivating also. More on that at the end of this report.

2.0 Background

Climate change and associated environmental issues in ruminant agriculture are a global issue. Individual countries are tackling these through a range of alternative investigation and mitigation strategies, many spending vast sums on often duplicated research and development projects in an attempt to not only meet climate change targets, but seek the 'competitive edge' for their unique circumstances be it at product or country level.

How often is agriculture and especially livestock (cattle) farming held up as an example of one of the main 'causes' of the climate change issue to an ill-informed public? Globally agriculture as a whole, not the ruminant sector alone, accounts for only 14% of the Green House Gas (GHG) emissions, but we are not good at defending or even promoting our industry as not a cause of climate change but indeed a potential solution!



Source – The Stern Review – The Economics of Climate Change

This lack of 'defence' is directly correlated to lack of knowledge. Yes 14% of emissions come directly from agriculture, though when you link (like many studies do) the quantity of land use (deforestation) directly related to the production of foodstuffs for ruminants, the figure increases. The challenge we have as a sector is obtaining robust data and developing our arguments. The many studies that have been undertaken have applied different methodologies and therefore obtaining the necessary data is a big challenge, then building messages on the back of this is difficult. The amazing aspect of this is that so often those who challenge agriculture or even livestock production systems in relation to climate change are not using robust data, though due to the nature of the issue, it gets reported.

Many challenges from pressure groups rely solely on the outputs of the FAO Livestock's Long Shadow Report published in 2006 where it stated about 7.1 billion tonnes CO2 equivalent or 18% of total anthropogenic GHG emissions (2/3 from extensive systems and 1/3 from intensive systems) arise from livestock agriculture.

This report itself was an over simplification of the issue (Gerber IDF Conference Berlin, 2009), and like many reports of its nature, has been continuously misinterpreted by the media and pressure groups who attribute this figure to just one species as opposed to the whole range. The report was written predominantly to act as a shot across the bows of developing nations indicating that as their livestock production systems develop, if they continue under current practices, they are unsustainable. This report certainly raised the issue of agriculture's role in the global warming debate, which has therefore created a challenge for our sector in not just decreasing our emissions but rather generating the knowledge required to make the necessary link between emissions and food production for the world's population. So often we see emissions from livestock production equated to a number of cars 'off the road'. My response is cars are a luxury, food is a necessity. Hence the purpose of this study.

3.0 The study

The aim of this study is to seek to bust myths, increase knowledge, capture opportunities for the UK cattle sector and importantly, as mentioned above, seek opportunities for the industry to collaborate both domestically and globally to determinedly demonstrate that we are moving in the right direction! The opportunity to undertake this investigation gave me experiences at all levels of the supply chain and also the opportunity to engage with the political dimension of the climate change challenge.

I have visited many countries and been able to meet a wide range of individuals at various stages of the supply chain and those developing policy. Each has their own level of understanding, views and ideas as to what the potential solutions are for cattle farming in the climate change debate. Importantly we need to connect more closely the supply chain with the policy makers, both domestically and internationally to ensure they are aware of not just the facts but the positive steps that have already, and will continue to be, taken by the sector in acting responsibly. I will go into more detail later in this report on some example initiatives that are seeking to achieve this.

The study, though initially focusing on actions at farm level, has moved towards providing recommendations at an industry level in an effort to provide policy makers with a clear and consistent message based on sound scientific outcomes and enabling farmers to have the necessary direction and guidance through which to adapt their farming businesses for a sustainable future.

4.0 Basket of gases

When measuring GHG's we measure these in terms of their Global Warming Potential (GWP). The main agricultural gas sources are Nitrous Oxide (N_2O), Methane (CH_4) and Carbon Dioxide (CO_2). In reporting we need to be clear that when discussing CO_2 equivalents (CO_2eq), we are talking of a 'basket' of these, based on their GWP, over a specific time period. The time period applied is usually 100 years, though sometimes other time horizons are considered. The GWP is calculated on a number of factors, though predominantly the:

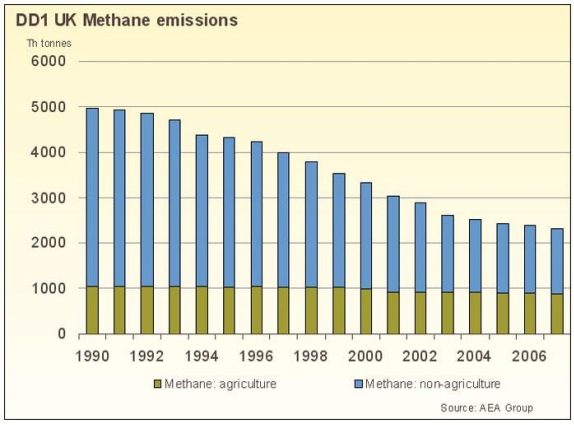
- warming power of the gas;
- length of time the gas is present in the atmosphere;
- chemical transformations the gas goes through in the atmosphere during the predefined period – as gases are emitted and combined with other gases in the atmosphere they sometimes undergo chemical reactions that break them down into other gases over time, some of which are less potent than the original gas.

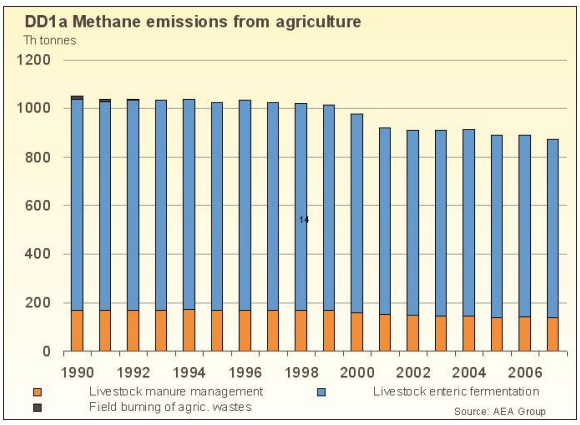
The following table indicates the GWP of the key agricultural gases. As indicated, Nitrous oxide has a GWP 298 times greater than carbon dioxide. This table is based on the International Panel on Climate Change (IPCC) 4th Assessment Report.

Gas	GWP – 100yrs
Carbon Dioxide	1
Methane	25
Nitrous Oxide	298

By the nature of cattle farming and the enteric fermentation process, yes, we are emitters of green house gases. UK agriculture as a whole is a net emitter accounting for 7% of UK GHG emissions. The agricultural contributions to the main GHG's are 1% carbon dioxide, 37% methane and 67% nitrous oxide.

The following tables provide some interesting points that we need to be aware of as a sector.



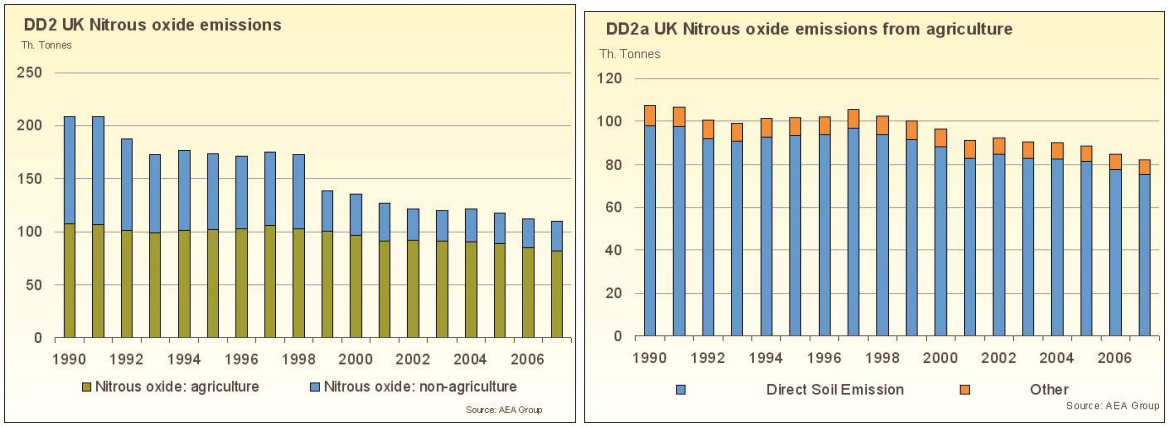


Source – Defra and AEA Group

In 2007, methane emissions, excluding those from natural sources, were 53 per cent below

1990 levels. In 2007, the main sources of methane were landfill sites (41 per cent of the total) and agriculture (38 per cent) of the total.

Since 1990 emissions of all three greenhouse gases, from agriculture, have shown a steady decline. By 2007, methane emissions from agriculture had fallen by 17%. My view is that although there has been this reduction over the years, the fall in agriculture is predominantly due to a decrease in livestock numbers and an increase in output, particularly for the dairy sector. How long can this be our approach? My fear is that it is not too long before agriculture, and predominantly ruminant agriculture, is the main source of methane emissions. As indicated by the above charts, enteric fermentation is our key area to target as it is the major source (eructation – 80%) of methane emissions. There are numerous initiatives attempting to tackle this particular issue globally, though any new development will be some 8-10 years away.



Source Defra and the AEA Group

Total nitrous oxide emissions fell by 47 per cent between 1990 and 2007. Between 1998 and 1999 the largest reductions were emissions from adipic acid production, an input to the nylon production process. Agriculture is now the main source, accounting for almost three quarters of emissions with approximately 92% emitted from soils that have been fertilized and associated leaching.

Defra reported that by 2007, nitrous oxide emissions (from agriculture) had fallen by 23% since 1990, with a drop between 2006 and 2007 amounting to 3%.

However, although agriculture still has a role to play in the climate change debate, a colleague from the USA dairy industry put the 7% of emissions from UK agriculture figure into perspective for me. He stated:

'Brian, I would find it hard to apologize to society for the 7% of GHG's emitted by agriculture, when at the same time you are providing them with safe, wholesome and nutritious foodstuffs'. This statement will remain with me until I die!

There are two important points that I know will take place in the future. 1. Emissions from agriculture will continue to reduce based on greater resource efficiency and new technological breakthroughs and 2. There is a growing world population estimated to reach 9.2 billion in 2050…we need to feed these mouths!

5.0 Measures and assumptions

Understanding climate change is an evolving science. To measure GHG emissions from a range of farming systems is extremely difficult. With individual farmers not readily being able to quantify the gaseous emissions from their farms it is a challenge for many to relate to the issue. Cattle farmers require a consistent approach to the measurement and interpretation of the carbon footprint of the dairy or beef supply chain. For farmers to engage and change, they need to have confidence in the outputs and we, as the ruminant industries, generally need to have robust data to report, to defend or even promote the positive progress from our industries. It is true that many figures used in calculating (note the key word here calculating… not measuring) carbon footprints are 'assumptions' though what we must ensure we do until more reliable measurement data is available is all use the same assumptions and be open about this.

I was lucky enough to meet with some environmental NGO's with initiatives seeking to get agriculture emissions reduced via a range of activities from reduction in dairy and beef production through to a more localized sourcing approach to consumer food purchasing habits. Both are sometimes questioned in terms of their overall impact on the current climate change situation. Much of the evidence they are using is limited in its robustness and is often quantified in terms of 'cars off the road' equivalents. What these types of campaigns do not do is ask society to change their luxurious lifestyles…why not ask every two car family to reduce to 1 car? The reason is that they know that society will not do this. Most people seem prepared to support changes as long as they do not impact directly on them. How many people support renewable wind energy, until it is to be built close to their house?!

The important point that I came away with after meeting the NGO's was that we, as a livestock sector need to engage with them directly. We need to inform them of what the sector is already doing and intends to do. When I took evidence with me and explained what the global dairy sector is doing with its Agenda for Action (see later in this document), it took them by surprise as their perception is still that agriculture is a traditionalist industry, still working in the CAP era producing more than we need just to claim the support payment. One NGO representative after our discussion stated that, based on what had been explained and demonstrated to him, he would be prepared to stand on a platform and state that the dairy sector was obviously trying to do their bit by 'base lining' and seeking to reduce these figures etc.

We need to engage with these organisations more, even if we do not have the 'exact' measures yet available. Collaborating on developing these measures is considerably more beneficial than seeking to impose our measures on them. As you will read numerous times throughout this document, measurement of these gases from complex biological systems such as livestock farms is far from a precise science! An example of this is seen on the Defra Observatory

Program, where it is stated that analysis of uncertainty in emissions estimates for 1999 and 2000 versions of the NAEI for methane is +/- 20% and for the 2003 NAEI results for nitrous oxide were between -76% and + 267%!

An example of where dairy initiatives are actively engaging with NGO's is in the Ben and Jerry's Caring Dairy Programme in the Netherlands. World Wildlife Fund (WWF) are actively involved as 'advisors to the initiative'. Also in the USA where Dairy Management Inc. (the US Dairy levy body) has a Memorandum of Understanding signed with WWF to ensure the work they undertake has their 'outside' eyes observing and commenting on how they can effectively incorporate the necessary environmental component of their work. These relationships ensure that the NGO is fully aware of the activities of these initiatives and through this working relationship improves the outputs for both organisations.

In the USA I visited sites in California of some very relevant research to my chosen topic. Knowing that legislation will be forthcoming on greenhouse gas emissions in the future, there is a research project based on a dairy unit accurately measuring the gaseous emissions from this 2000 cow unit. This work is jointly funded by the USDA and the Californian dairy farmers through the Western United Dairymen organisation. Dairy farmers in California do not want the measures that future legislation is based upon to be 'assumed' measures. They want to have the legislation based on the actual measures that will be taken from a range of farms, both beef and dairy, in their study. The results once analysed by the University of Purdue, go directly to the States Environment Protection Agency (EPA) for incorporation into the developing legislation. The interesting point is that the farmers do not see the actual measures taken, even though they are contributing to the studies finances.

This work will link with some other USDA funded work at the University of California, being conducted by Dr Frank Mitloehner, using Bio Bubbles, where livestock are housed in a number of forced ventilation chambers that can measure emissions from the animals on a range of diets.

6.0 The lifecycle analysis

The system of measurement utilised in the calculation of the environmental impact of a product is known as Lifecycle Analysis (LCA). This technique analyses the 'production process' accounting for all inputs and outputs that cross a predefined boundary.

The International Panel on Climate Change (IPCC) has defined a basic methodology and subsequently, the Publicly Available Specification (PAS) 2050 was launched in 2008 by the British Standards Institute, in order to provide guidance for the development of LCA models for any goods and services. Though developed by the British Standards Institute in collaboration with the Carbon Trust and Defra, the PAS2050 is not a British Standard. It is guidance only.

There are only a few tools operating in the livestock sector that conform to both IPCC and PAS2050 guidelines. At a UK industry meeting in January 2009, coordinated by DairyCo, it was agreed that although there are still many grey areas to be addressed in developing carbon foot

printing tools, these two standards are the best that are currently available until further evidence-based developments are adopted by the industry.

Although the UK has considerably more activity than many countries, one worthwhile example to note using a very different approach is in the USA. Chicago based Dairy Management Inc. through the University of Arkansas have embarked on a substantial supply chain initiative in order to fully quantify GHG emissions associated with fluid milk. Not only are they undertaking farm level work, but are also in the process of commissioning twelve different projects throughout the dairy value chain aimed at reducing GHG emissions. Preliminary indicators emanating from their work from the entire supply chain (cattle feed ingredients through to the consumers plate) are accounting for less than 2% of the US greenhouse gas emissions. The approach for quantifying the GHG emissions at farm level is a different process to what is being applied in the UK. It will be interesting to review and assimilate the final results which are due shortly.

7.0 Reporting

We need to consider carefully how we manage data responsibly once we have undertaken carbon footprinting activities. By publishing 'numbers' we stand the risk of these numbers being very different in subsequent years as a result of changes in farming practice. Any changes in numbers will need to be carefully appraised. Importantly we need to be clear on the metrics applied to any reporting. When researching for this project finding data that reported in the same terms was extremely difficult. This alone causes confusion and increases the potential for mis-reporting.

The Carbon Trust (UK) has established a commercial arm to aid the low carbon economy. They are known as the Carbon Trust Footprinting Company (est. 2009), formerly the Carbon Label Company (Did they change when they realised that carbon labels were not a key driver in the route to a low carbon economy?). Though working towards that ultimate goal, they are also providing verification services to ensure that the measures/calculations being applied by industries for their products are consistent and comparable.

Having the Carbon Trust verification enables you to use the Carbon Trust logo. Originally this logo was supported by the Carbon footprint (an actual number)of the product, as verified by the Carbon Trust. Once again the Carbon Trust has recently changed the rules, realising the variability in product manufacturing, especially with food production, that now the number need only be visible somewhere prominent on the organisations profile, such as a website etc and not necessarily on the product itself.

The experiences of those I have spoken with, who have attempted to incorporate carbon footprinting numbers on products, is that the consumer firstly wants another similar product to compare it with and secondly does not really understand what the number means anyway! The experience of Fonterra NZ, when they undertook their carbon footprinting work in 2008/9, was that when the numbers were released, the question from a member of the public, 'is there carbon in milk and how does it get there?' was asked.

Tesco's have labelled their own brand liquid milk with numbers of carbon footprints as verified by the Carbon Trading Company. It is questionable whether this has had any impact on purchasing behaviours of consumers, especially on a staple such as milk. On the positive side, should a consumer get down to the small print, there is a statement on how consumer action regarding the recycling of the bottle and how this can then lower the carbon footprint of the product.

There are many countries and food manufacturing organisations investigating environmental labelling for their products. Based on experiences to date, I believe that the consumer wants to know that a product has been produced to an environmental standard that is rigorous and basically does some good. I would like to see a dairy version of the Forestry Stewardship Council which demonstrates a business' social and environmentally responsible practices in the marketplace. Surveys in countries like the Netherlands and Switzerland have reported recognition levels, what the logo is and support FSC as high as 50%. Wouldn't it be great if we could get a similar result for the world dairy producers and associated logo recognition!

One of the challenges we have in the UK is the up-rating of our fairly basic (Tier 1) national reporting system known as the UK Greenhouse Gas Inventory. This is undertaken as an obligation under the Kyoto agreement and reported via the United Nations Framework Convention on Climate Change (UNFCCC) which follows the guidelines established by the IPCC and is compiled annually.

Though this study was not intending to delve into carbon trading, I feel that it is worth a mention based on the experiences that I have seen and heard. I saw examples of emissions trading involving agriculture, mostly in the USA, though they are also operating here in the UK as fairly loose arrangements. American experiences seem to indicate that the real beneficiary is sometimes the trader and not necessarily the farmer. There are farmers in Ohio, receiving credits for their specific farming systems (direct drilling as opposed to conventional tillage practice).

The challenge we and many others working in this field have is quantifying the value of agriculture to the sequestering of carbon from the atmosphere. If there is any area where agriculture and especially extensive livestock farming can play a role and importantly be recognised as a potential solution to this issue, it is via this route. I met with one researcher in France who has calculated that permanent pasture of 30yrs+ has the potential to sequester in the region of 500kg/CO2/ha/pa with younger pastures sequestering up to 200kg/CO2/ha/pa . But is this applicable throughout the globe and how can we record practices to build this into a viable scheme? Importantly there are models already working successfully. We as an industry should be looking at these and building models and evaluating the various activities they are working on. This was certainly behind some of the discussions in Copenhagen (COP15) with agriculture representatives.

8.0 How do we fare…or should we care?

The UK industry has a dilemma! Reporting as we are, in its simplest sense (Tier 1 predominantly) we are taking the number of any specific livestock and multiplying this by a default factor to get the 'emissions levels' for that specific gas. But this is a crude methodology.

I was encouraged by what I heard when I attended a two day workshop with Defra where they were exploring the wider requirements of moving to a higher (more complex) tier of National Inventory for the UK. The workshop was certainly a positive experience with many great ideas regarding recording systems, both required and inspirational. The challenge that Defra now has is to translate the outcomes of this workshop into meaningful projects and specific deliverables, though sadly this will not take place as quickly as we require it.

Nutrient dense food emissions are a valuable consideration for the environmental impact and one which should be reviewed with vigour by the industry. Work conducted by the UK Diary Council highlights the value of milk from a nutrition perspective. To get the same quantity of calcium provided by a 200ml glass of milk, one would have to consume 4x185 gram servings of broccoli or 11x90 gram servings of spinach, and that's just calcium! Work at the Chicago-based Global Dairy Platform is currently taking this concept to the next level and considering the nutrient density of milk and the associated carbon footprint of the product 'basket' that would equate to the same nutrient profile using other foodstuffs.

If we look at the recently published J.L.Capper et al study, entitled *The Environmental Impact of Dairy Production 1944 compared with 2007*, based on the US Dairy industry, there is a valuable efficiency message. Modern dairy farming systems require far less resources than they did in 1944 to produce the same 1 billion kilograms of milk. The modern dairy farm according to the paper requires only 21% of the animals, 23% of the feedstuffs, 35% of the water and only 10% of the land. The carbon footprint to produce this same one billion kilograms of milk in 2007 is equal to 37% of what it was in 1944!

This is just one example of greenhouse gas emissions reductions as an industry and there are many more available for us to utilize.

9.0 Cattle farmers and climate change

For cattle farmers to make the necessary changes in farming practices and have these quantified, I appreciate that consistent and robust standards need to be established and communicated to end users possibly via third parties to provide the necessary assurances. Industry representative organiSations need to provide the farming community with a framework within which business change is encouraged. Evidence of such initiatives was seen in the USA, the Netherlands and here in the UK.

Best farming practice makes better business sense and improves environmental performance - for a time. The Dutch dairy sector claims to have reduced its GHG emissions by 25% and is in

front of their Kyoto targets. What they recognise now is that it is the combination of smaller actions that will be the basis of future improvements.

10.0 Research investment – on the right things!

In recent years in the UK research investment has been absolutely focused on environmental issues, with only limited funds allocated to 'production' orientated studies. Now with food security on the agenda, globally, there is a strong linkage between production research and environmental impacts. It is predicted that the world's population will rise to 9.2 billion by 2050 from the current level of 6.7 billion. There are considerable issues with regards feeding this growing population. There need to be cross-cutting research programmes at basic as well as applied levels.

On my international travels I was able to see numerous research initiatives, many with very similar objectives to those seen elsewhere and many with international application potential. Studies in Australia developing drought tolerant varieties of wheat, for example, may well be applicable to India and even in the future to the south east of England. We need to find ways of joining research projects up for the benefit of all countries. It is in my mind, almost too late for researchers to wait for a published paper to learn of new studies and their outcomes. There almost needs to be a networking facility to share knowledge at a faster rate to enable agriculture to adapt and perform the important role that it has in feeding future population growth.

11.0 Copenhagen 15 meeting, December 7 – 18, 2009

Having the opportunity to attend this conference was a massive honour as well as a steep learning curve. It was impressive to appreciate the sheer number of people working in this area across all industries. This is fast becoming known as the 'green collar worker' sector! On the flip side, it is incredible how many organisations/pressure groups there are seeking to reduce the output of animal agriculture. It was also significant to note that we now have environmental and animal welfare groups joining forces as they both see that their objectives can be delivered through the climate change mitigation process.

The main thrust of the combined agriculture community at the talks was to get 'agriculture' as a whole, positively included in any agreement, as an effective mitigator of emissions, not just an emitter. Under the current rules, the only way agriculture can play its part in the process is by reducing production.

The conclusions drawn at the end of the 'agriculture day' where key messages for the negotiators were formed were:

- **It is critical that food security be integrated into the shared vision of the Long Term Cooperative Action text, in order to open the door to adaptation and mitigation support;**
- **The early establishment of an agricultural work program under the Scientific Body for Scientific and Technological Advice (SBSTA)**

- **Reduced Emissions from Deforestation and Forest Degradation (REDD) should include agriculture, forestry and other land uses;**
- **Landuse, Landuse Change and Forestry (LULUCF) accounting system needs to be favourable to agriculture.**

The key factors for me as an individual contributing to these discussions.

- Agriculture, more than any other sector, will be affected by climate change;
- Adaptive actions are already taking place throughout the world and these are unrecognised – a concern that I have had in the UK for some time!
- The difficulty in quantifying the real impact of mitigation and adaptation are often used as an excuse for not including them in the 'rules', as indicated earlier in this document. This needs to be overcome.
- Discussions were related to both agriculture and forestry together. It was agriculture working collectively and collaboratively. This was encouraging as we do not want the agricultural community involved in public discussions regarding one food source over another. It is all about a safe, nutritious and balanced plate of food for all, produced in a sustainable way.
- The world population is expected to reach 9.2 billion by 2050. Currently there are already 1 billion who are not receiving the nutrient intake they require. Food aid programmes need to change their approach. The USA in future will be altering their protocols to more of a supportive role in terms of enhancing food production systems in the affected countries as opposed to just sending basic food stuffs.
- Recognition of the role of women in agriculture was significant. Some three quarters of the world's agricultural workforce is female. When we consider 'sustainability' in its broadest sense, the social aspects are as important as both the economic and environmental pillars when considering climate change.
- The cost of adaptation is estimated to be between $US100 billion and $400billion per annum if we are to achieve our goals of sustainably supplying the world's growing population with the necessary foodstuffs. It was argued that this needed to be additional to existing funding and should not just be directed towards emerging economies, but all agricultural systems requiring change wherever they are located.
- As a global sector we need to make the transitional step from crisis management to risk management in our production systems. We will undoubtedly be farming in a 'new environment' with new challenges in terms of pathogens, insects and weeds being examples of but a few factors.
- Food security equals national security.

- We need enhanced investment in the science so that it can keep pace with the climate change challenge.

- Agriculture can be seen as 7% of the problem but, more importantly, potentially 20% of the solution!

The 'strap line' that emanated from this meeting was:

'Agriculture is where the challenges of food security, climate change and social welfare intersect'

12.0 Industry Initiatives

12.1 Centre for Innovation – U.S Dairy

There are many different global activities specifically aimed at reducing 'carbon' (equivalents) from their associated production processes. We all commission/undertake activities in our respective countries to answer the same challenges and would benefit greatly by increased collaboration.

The Centre for Innovation for US Dairy initiative was, and continues to be, both ambitious and impressive. The initiative focuses on collaboration, engaging with some 400 stakeholders from throughout the supply chain, who have agreed a set of guiding principles.

The dairy industry is committed to:

a. recognising and appreciating all members in the value chain from farm to table;
b. working collaboratively with all stakeholders, consistent with the vision;
c. taking responsibility for our environmental impacts and celebrating our positive contributions to the planet;
d. ensuring economic fairness across the value chain;
e. preserving and enhancing the health and wellness of all people;
f. utilizing both sound science and a transparent process to foster continuous improvement.

From which the following work priorities emanate:

- sustainability;
- health and wellness;
- product development, information and communications;
- regulatory issues (excluding pricing);
- consumer confidence;
- globalisation.

The initiative's first goal is to reduce GHG emissions (all products) by 25% by 2020, which is not too dissimilar to that agreed in the England Milk Roadmap published in 2008, though the England initiative is purely for fluid milk. This US initiative has a start in the fluid milk area as

documented by their own ‘roadmap’ whereby they are seeking to reduce emissions by 12% against a 2007/8 baseline GHG footprint.

To achieve these goals there are some twelve projects either proposed or underway, which encompass the entire supply chain, from crop production, milk production, dairy processing, packaging, transport and retail. Briefing notes of these initiatives can be viewed at:

http://www.usdairy.com/sustainability/TheCommitment/GreenhouseGas/Pages/GHG-Reduction-Projects.aspx#Crop Production

Having had the opportunity to work alongside these initiatives as part of my Nuffield experience, I was impressed by the levels of support and cross fertilisation of ideas from those involved in the sector, which was certainly not perceived as a box ticking exercise! Many of the proposed projects when I was in the US did not yet have funding streams, though there was confidence that through collaboration the necessary resources would be obtained.

12.2 DairyCo farm level activities

12.2.1 Understanding

DairyCo, as a major contributor to the development of the England Milk Roadmap, realised that a major challenge for them and the dairy farming sector was a basic knowledge of climate change, the impact they have on this issue and the impact that climate change will have in the future. For this reason DairyCo has commissioned several pieces of work to provide the necessary underpinning knowledge from which they can undertake further activities, be they communications campaigns to inform farmers or the commissioning of additional research that addresses issues being, or to be, experienced by the farming industry. Importantly, DairyCo has engaged with the beef sector levy board EBLEX where possible to capture a wider perspective on the issue.

Additionally, they have provided considerable resources and data to more comprehensive government-funded research projects directly related to cattle farming, which allows them to have a seat on the project steering committee. This is vitally important as so often major research projects are commissioned by major funding bodies i.e. not the farmer levy boards and that vital communication link in the research chain is missing. It is organisations such as farmer representative bodies that must be at the table to permit a practical application of the study designs and outputs and enhance the speed and suitability of farmer communications of the study conclusions.

12.2.2 Fact sheets

DairyCo has invested in simple fact sheet development for dairy farmers to explain the GHG issue to them from a dairy perspective. So much of what dairy farmers were hearing was that anaerobic digestion was ‘the’ answer, whereas for the majority of farmers, increasing the efficiency of their own production system was potentially a better solution with a lower capital investment! The DairyCo fact sheets are an ideal starting point for this complex issue.

12.2.3 Meat Roadmap

Late in 2009, the red meat sector in England launched phase one of its Roadmap. Very different in presentation to the Milk Roadmap. Phase 1 basically quantifies the environmental status of the red meat sector and links potential targets with the UK Governments Low Carbon Transition Plan. It is difficult to measure how effective this Roadmap will be until we see Phase 2 which is due for launch in the first half of 2010.

12.3 Ben and Jerry's – Caring Dairy

I was lucky enough to be immersed in the Caring Dairy Project for three days in the Netherlands. The Caring Dairy Initiative was initiated by the Ben and Jerry's Ice Cream business and implemented by the forward thinking eleven dairy farmers who were selected to supply Ben and Jerry's European ice cream manufacturing operation.

The project was launched in 2003 and is a partnership between Ben and Jerry's, local dairy farmers, Cono Cheesemakers and Wageningen University. WWF and the Netherlands Society for Nature act in an advisory capacity to the programme. The project focuses on developing sustainable farming systems with objectives of economic viability, social progress, environmental protection and animal welfare.

Within these core areas, eleven sustainability indicators have been established with associated indicators:

- Soil Fertility and Health
- Nutrients
- Biodiversity
- Energy and Climate Change
- Social Human Capital
- Animal Welfare
- Soil Loss
- Pest Management
- Farm economics / Value Chain
- Water
- Impact – Local Economy

The farmers then undertake a self assessment of their dairy farm and identify which areas they propose to concentrate on and then develop a suitable action plan annually. Usually three

areas are addressed annually. As part of this process the farmers are supported by workshops involving veterinary or economic specialists. Importantly the farmers choose and therefore own the change process.

The bit I am sure you all want to hear is….yes the dairy farmers are compensated for their efforts to a value of €0.05c/l, additional to their standard milk price.

The core team of farmers (and wives) and advisors for the Caring Dairy initiative

I was fortunate to be invited to join Unilever (who own Ben and Jerry's) Brand Managers from across Europe for a day on a Caring Dairy farm to inform them of the attributes of the approach that these farmers were taking when producing the milk that supplied the brand. The vast majority of these representatives knew nothing about dairy farming (you could tell this by the clothes that they were wearing!) and it was rewarding for us all in dairy farming to see them really appreciating the messages from the farming side. Impressively the farmers themselves did all the speaking - not the sales people of Cono. Their confidence to do this (all in English!) I believe comes from another vital ingredient of the Caring Dairy initiative – group work and benchmarking. Yes, we do care about animals, yes we do care about the environment and the social side of farming and yes it is a business that requires great skill! Importantly, the brand managers are now armed with the information they require to market the Ben and Jerry's 'sustainability' message with confidence.

The original dairy farmers who have all now completed these eleven modules have met regularly together and completely benchmarked their businesses and fully understand not only their costs of production but the interactions within their business. Their businesses are progressive and they have a holistic view of farming including those vital components of social capital, i.e. the people and the environment. By working in a discussion group format over time and supported by specialists they are starting to make great change to their farming practices, especially in the energy area. They are fully aware of the climate change implications of dairy farming and are actively working in their own ways to adapt their individual businesses to

reduce the footprint. This may be in the form of nutrient planning, more effective use of heat energy from the dairy plant or even farm scale anaerobic digestion. What they have is the support of the discussion group to use as a sounding board but more importantly provide the confidence to move forward in innovative ways.

In speaking with Alfons Beldman, the economic specialist from Wageningen Universtity for the initiative, the next step for the farmers is to start putting a financial return from an environmental perspective of their respective actions. Having met the farmers involved I can see that they will be up for it!

After the day with the brand managers, I was lucky enough to spend the next two days visiting the farms of the Caring Dairy Farmers and see how they are putting into practice the Caring Dairy initiative. Each one had differing actions. No farmer was doing the same thing, though via the group work, they were sharing these and challenging others to do the same. One area that they are working on at present is solar energy and how they can implement these viably on individual units (hopefully with the aid of grants which are currently not available). But the most important thing I learned was the shear positiveness of these young farming families and their enthusiasm to continually improve, and not just in the areas of production! They were motivated by and effectively owned, the Caring Dairy Initiative.

The challenge now for Cono Cheesemakers, is to implement this program with the remaining 550 suppliers of the operation. Having stated that, if the motivation and enthusiasm of those that I met already undertaking the program is anything to go by, then there is definitely something there for the others to learn from and subsequently get their teeth into.

12.4 England Milk Roadmap

This development launched in 2008, was a government initiated exercise, though driven by the dairy supply chain. The Roadmap analysed what positive activities the industry has already undertaken in relation to environmental issues (i.e. more than just greenhouse gases) and then set challenging targets for each level of the supply chain from pre-farm through to retail, to improve from this point. The targets were established to cover three time periods, short-term 2010, medium- term 2015 and longer-term by 2020.

The Roadmap, although setting challenging targets, was not specific in how these targets would be met. It is up to the respective levels of the industry to appreciate the targets and work towards the reduction of these on a voluntary basis. The challenge that the supply chain has is now capturing and quantifying progress against these targets in the key reporting years of 2010, 2015 and 2020. The farming sector will have the greatest challenge simply because there are many more of them than processors, retailers or fertiliser manufacturers and each system is different and the level of record keeping in this department is minimal. Capturing meaningful and robust data for this part of the value chain will require considerable effort if the Roadmap is going to continue with the level of recognition and respect that it currently has. I personally believe that there needs to be more effort at the farmer organisation level to achieve the desired outcome. More of this in my recommendations!

Though the Roadmap is not binding it is the first of its type to be launched in England and has been seen by others around the globe as an extremely positive step forward and a useful aid in working with government in an effort to minimise legislation in the area. Since this launch the Welsh and the American's have also established, or are in the process of establishing, their own versions of this document.

Where the development of this initiative was valuable was in pulling the respective levels of the supply chain together and debating where we are at in terms of a baseline for the sector and where we needed to address issues collaboratively.

13.0 Global initiatives

13.1 Common methodology for lifecycle analysis in dairy

The International Dairy Federation is investing in research and development towards the formulation of a consistent LCA methodology for dairy production for both developed and developing nations. This work will aid the global industry greatly in managing the issues caused by the Food and Agriculture Organisation's Livestock's Long Shadow report launched in 2006.

So often in agriculture and even dairy or beef production we read of published studies indicating specific numbers associated with greenhouse gas emissions from the farms or models they have researched. Aligned with this we have a range of methodologies being applied at farm level, calculated for marketplace requirements. The concern of the IDF is that rarely are methodologies consistent and levels of uncertainties and assumptions are great.

Preliminary work commissioned by the Sustainable Agriculture Initiative Platform, Dairy Working Group reviewed a range of existing GHG studies including those undertaken by its member organisations such as Nestle, Unilever, Fonterra, General Mills, Danone, Kraft, McDonalds Pepsico and Friesland Campina. The purpose of the review was not to review the data emanating from these studies, but more to compare the methodological approaches used. Twenty seven studies were included in the review.

The study identified:

- that individual studies were based on a variety of objectives from informing new produced development to supporting external product claims or the identification of 'hot spots' in the production chain;
- depending on the purpose of the study, different assumptions and choices were made in areas such as allocation, system boundary or scope.

These are fundamental differences that ultimately lead to misinterpretation when used by 'others' in the public domain. SAI Platform has made the final report of this review available to the IDF for their study as the SAI members are in total support of the development of a consistent methodological approach based on the outcomes of this work. SAI Platform is also working closely with the IDF in assisting them in delivering this important piece of work.

The IDF has agreed to develop these guidelines in collaboration with others working in the same area such as the World Business Council on Sustainable Development (WBCSD), in Geneva and The Carbon Trust here in the UK to develop a meaningful and reliable and science-based method of calculating the carbon footprint of milk and dairy products from the farm to the factory gate. At least then we will have consistent and comparable figures to fully appreciate where the greatest effort is required to limit the emissions from the sector.

Surprisingly the global beef sector is only just embarking on initiatives such as life cycle analysis and footprinting activities. Based on the developments to date in the dairy sector, it has become increasingly clear of the importance of collaborating on these initiatives. There are implications for both sectors based on the lifecycle methodology applied and hence close dialogue in the developmental stages is crucial to ensure mutual understanding and ageement.

13.2 Disaggregation of the Livestock's Long Shadow Report figure of 18%

The IDF has also contributed important resources to the FAO to disaggregate the original reporting of 18% from all livestock, to ascertain the respective dairy and beef contribution to this. Reflecting on the coverage in the media and press and the associated actions by governments and their subsidiary bodies, this is a vital piece of work as too often the 18% is attributed to purely beef or dairy and not a wide spectrum of animal species.

This is a totally new study with new data and not just a re-evaluation of the old reports data files. Dairy and beef production individually is likely to be a small percentage of this 18% figure and it is important that the FAO quantify this figure and report in collaboration with the respective beef and dairy sectors. The dairy report is due for launch in early 2010 and the other livestock species will be published later in the same year.

Methodologies developed for this unique study will be, where possible, incorporated into the common methodology activities to promote consistency and the utilisation of similar secondary data sets for different parts of the world and associated production systems.

13.3 Global Agenda for Action

The Global Agenda for Action was a fantastic example of collaborative action by the dairy sector (I was lucky enough to be part of it!). The Agenda for Action takes the opportunity to highlight the progress that the dairy industry has made over recent years in terms of sustainable production, though also goes a step further by emphatically stating what actions, a responsible industry will implement in the future towards the environmental agenda:

- promotion of the development of a standard methodology framework for assessing the carbon footprint of milk and dairy products based on robust science;

- promotion of the adoption of world's best practices within the global dairy sector and actions that
    - lead to the reduction of global greenhouse gas emissions from dairy production on a per unit of production basis

    - promote the use of technologies and methods that improve the processing and distribution efficiency of dairy products;
    - optimise economic, environmental and social outcomes for global dairy stakeholders
    - recognise different levels of development and local conditions,
    - build on existing frameworks and knowledge, including for scientific advancement and technology transfer
    - promote decision making based on robust science and
    - complement initiatives in other areas of sustainability
- seek to advance the establishment of tools to facilitate measurement and monitoring of emissions both on-farm and in dairy manufacturing;
- promote improved farmer understanding of agricultural emissions and opportunities to reduce greenhouse gas emissions on farm;
- support sharing information and aligning research efforts to develop cost effective mitigation technologies for both on farm and manufacturing application.

(The full Agenda for Action document can be viewed in Appendix 1 or www.dairy-sustainability-initiative.org)

The dairy sector agreed that these words alone were not enough as a commitment. The development of a web based 'Green Paper' was where the real value would be added. The Green Paper is basically a catalogue of examples of what individual organisations/ farms / collaborations are undertaking in relation to the Agenda for Action. Categorised into six key areas and are specific to delivering against the Agenda for action objectives. This is a truly global and dynamic aspect of the collaborating dairy sector organisations. On launching in Berlin in October 2009, there were some 260 examples from 40 different countries. These can be seen at www.dairy-sustainability-initiative.org

14.0 Political drivers - blinkered vision and joined up thinking

My Nuffield experience has confirmed in me that the policy makers are not always 'joined up thinkers'. The water issues in Australia, the particulate issues in Western USA or the need to link utility companies with on-farm power generators (USA) were all examples. The impact of policies that are not joined is a missed opportunity and risks a greater impact on the environment. It is clear that true visionary political leaders must now consider environmental considerations together with other target issues of agricultural policy.

14.1 Dichotomy in the USA

Having the opportunity to spend a short time with Frank Castelanelli at his dairy farm in California highlighted these points.

Frank has a dairy farm (and vineyard) and has been generating electricity from the methane from his anaerobic digester since 1994. Frank was unable to secure a viable contract with a utility company to purchase the 'green electricity' that he was generating. Instead the whole farm was connected into this power generation systems and the remaining methane is 'flared'. This seems wasteful (I heard this numerous times throughout the USA), though like any business, the economics need to be right for both parties!

When visiting, there was no legal requirement or governmental direction given to utility companies in the individual states to source a given % of their power from green sources. At least in the UK we have clear direction from the government supported by appropriate incentives to establish a power generation facility on farms where the business case is viable.

California has, though continually improving, an air quality and air-borne 'particulates' issue. Frank now has a problem with the emissions generated by his generator! Due to its age, the particulate matter emitted from the exhaust exceeds the state limits! He now has a choice to either retrofit it with appropriate filters (US $35K) or install a new generator (US$130k). This seems ironic as here is a progressive farmer trying to do his best in reducing GHG emissions and is being caught by a separate law. On the bright side, apparently the farms power bills have reduced by US$130k annually!

Many dairy farm businesses, and other businesses, are actually choosing to leave the state of California as the environmental air quality legislation is becoming too inhibitive to business development, progress and profitability. I spoke to one producer with almost 4000 cows who had moved to a neighboring state, not because they want to pollute, but simply that they want to operate in a 'normal' market place. This is a classic example of exporting the problem, the gases/particulates are still emitted just in a different geographical area. The example here is on a State level, though is also pertinent on a national/international level.

The anaerobic digester, generator and flare at Frank Castelanelli's farm

14.2 Innovation Centre for US Dairy MOU

During the Copenhagen Climate Change Conference the Innovation Centre for US Dairy and the US Department of Agriculture signed a Memorandum of Understanding (MOU) for collaborative work towards the Innovation Centre's target of reducing GHG's from the sector by 25% over the next decade. Jointly the two organisations have identified a variety of projects that work towards achieving these goals whilst also increasing both financial and environmental sustainability.

Through this agreement the USDA will take a number of steps to help farmers, including supporting a strategic research plan aimed at helping the sector further reduce its environmental impacts. Other initiatives will help the sector develop future technologies (work on enteric fermentation has been identified as one of the key areas), advance nutrient management, support renewable energy (anaerobic digestion) and improve energy efficiency.

This is a fantastic example of the industry taking the initiative and then engaging with government departments in an effort to accelerate their work to achieve even greater outcomes, predominantly for the public good. I will be following the developments of this MOU closely.

14.3 Bavaria

Whilst in Germany I met with quite a unique group, the Bavarian Farmers Association. Bavarian farmers are unique as the majority of their herds have less than 50 cows and many of them will have additional employment to their agricultural enterprises.

One key aspect of their links with local government and the tailoring of support payments to suit regional conditions were noted here. To promote better nutrient management and reduced greenhouse gas emissions, additional financial payments were available for those who chose to undertake more environmentally sound practices. For example if slurry was injected as opposed to spread via a splash plate, a greater support payment is received. The potential to upscale initiatives like this is immense. Once again a very simple approach that is effective.

These simple mechanisms were not without their problems, i.e. when contractors heard of the greater support payments for specific techniques, apparently the cost associated with those techniques increased!

14.4 European Union

Earlier in this document I explained the Global Agenda for Action and the associated Green Paper. I was asked to Join the European Dairy Association luncheon for members of the European Parliament to outline the Agenda for Action and the Green Paper and explain to those present that the dairy industry globally is collaborating on this important issue. A similar event was held for members of the European Commission some weeks later.

What this Agenda for Action has provided is a vehicle through which dairy sector organisations can engage with others, using a consistent message and importantly a message that is not just

an organisational sell. I think this last point is where the value comes. Similar to what you will read below with regards the motor industry, the collaborative message for a common cause is extremely powerful.

Those attending the luncheon, were noticeably impressed with what the dairy sector (EDA indirectly) has achieved. One member stated, '*when the sector financially is on its knees, you are still doing all of this!'*

The examples above are completely contrasting though all have one common thread. They are developing viable concepts as responsible sectors and are then engaging policy makers, not seeking finances, merely to inform them of the systems they through sectoral collaboration have achieved. Yes, collaboration with governments can be achieved, though my take-home message here is, you must achieve something as a sector first before then engaging.

15.0 What can we learn from other industries?

Organizations such as the Sustainable Agriculture Initiative Platform, World Business Council for Sustainable Development and the World Resources Institute are also working hard with many industries including agriculture to aid larger businesses in taking positive steps to reduce their environmental footprints. Much can be gained through linking with these organisations to appreciate the challenges from different angles and approaches that have or have not succeeded in other industries.

15.1 The Motor industry

It is not just the agricultural sector that is tarred with the 'emitter' badge. Engaging with a different industry provided the opportunity to consider the cattle industry through a different set of eyes. The motor industry is grappling with similar challenges and has a synergy with agriculture. Much of what can be done to reduce environmental impacts requires little more than lateral thought. BMW, Munich, demonstrated this with one simple example…recharging the battery from the energy generated through the car's braking system. Traditionally this energy would have been lost and a separate motor would have been driven to recharge the engines power source. This begs the question, what can we do in cattle agriculture to capture or additionally utilise energy or 'by products' that we have generated? We already have anaerobic digestion-but what else can we envisage and develop?

The EfficientDynamics programme in their cars looks for ways of improving the fuel consumption of their vehicles through efficient energy generation, aerodynamics and lightweight energy management within vehicles. Other (but not all) examples of relatively simple but effective actions under the EfficientDynamics concept are:

Stop Start Technology - Saves fuel when the car is stopped by stopping the engine, hence cutting fuel consumption and emissions.

Electric Power Steering - The power steering uses lightweight electric motors that only operate when required as opposed to the constant pumping of fluid in traditional power steering systems.

Optimum Shift Indicator - The cars computer informs the driver of the most appropriate fuel efficient gear for current circumstances.

Active aerodynamics - Engine air intakes are closed on engine starting, to assist the engine reaching operating temperature faster, thus reducing fuel consumption.

BMW are also involved in a public/private collaboration known as the Transport Energy Strategy (TES). This collaboration involves their competitors such as Volkswagen, General Motors, Ford, Daimler Chrysler and many of the petroleum companies and energy supply organisations. This initiative is voluntary and focused on finding answers to sustainability and affordable security of motorised mobility and ultimately develops strategies from these answers. This initiative has been operating since 1998 with the goals of:

- contributing to the reduction of CO2 emissions;
- reducing petroleum dependency;
- conservation of energy resources;
- moving the initiative beyond the boundaries of Germany to Europe.

Hearing of this initiative encouraged me as I could see considerable correlations between this industry and agriculture and the need to engage with government. The biggest challenge that we have with our UK agriculture-based initiatives is that compared to initiatives such as the TES, they are very short-term. Both industries have challenges that require longer-term commitments – Genetics in Agriculture and bridging the gap between fossil fuels and hydrogen propulsion technologies in the motor industry. Yes, they must maintain focus and deliver on agreed objectives, though longer term commitments to our issues could well benefit some of our industry needs in the climate change challenge.

I also learnt that BMW was collaborating with competitors on new automotive technologies. Stop Start technology was developed with one of its major competitors. The attitude they take is that the competition element is in the final package – the car and not that piece of technology alone.

The Hydrogen fuelled car was first launched in the BMW 7 series in 2006. This is the future of motorised transport. Currently they have 100 of these on the road with some major public personalities. Possibly too big a jump for society at this point in time, hence the limited number on the road.

BMW are also looking at wider opportunities. They are working closely with the energy generation sector to ascertain if energy could be produced in off-peak periods, stored in the batteries of electric cars and then released back to the grid for the peak periods if not required by the car. Simple concepts that need exploring!

I left BMW with a refreshed feeling and also with the feeling that whatever assets we have we should look to see how we can maximize the use of these assets

15.2 The aviation industry

The airline industry is another industry which is a major contributor of greenhouse gases. Through their representative body the International Air Transport Association (IATA), which has 230 members and serves some 93% of scheduled international traffic, has set targets for improving their image to the public. Like agriculture, the airline industry also claims to bring social and economic benefits through global mobility.

Two key targets have been established:

- Carbon-neutral growth from 2020;
- 50% reduction in carbon emissions by 2050 compared to a 2005 base line.

To achieve these targets, they have agreed three key activities that will be implemented by their member airlines.

1. New more efficient aircraft and associated technologies - by 2020, you will arrive at destinations having emitted 21% less emissions. The use of sustainable biofuels in the airline industry has the potential to reduce aviations footprint by up to 80%, with to date five airlines already testing their use.

   Lightening aircraft through their frames, trolleys and even meals trays, will reduce CO2 emissions. IATA claim that by lightening every aircraft by 1kg has the potential to save around 8000 tonnes of CO2 annually.

2. Flying Smarter – shortening flying times by a minute, has the potential to save 100kg of CO2 per flight. To date IATA have claimed to have 'optimized' over 2000 routes, already saving 34 million tones of CO2. This surely also makes good business sense. As with agriculture, there are always win win situations in terms of business efficiency.

3. IATA freely admits that technological advances and efficiency of aircraft operations is not enough to achieve their agreed target. It states that carriers will need to engage with global carbon markets. As currently international air travel is not included in national inventories (due to allocation issues), there is a need to develop a global sectoral approach that will make aviation fully accountable.

This last point is important to us as an agricultural sector. How many times have we heard that agriculture emits more greenhouse gases than transport. Now you know why!

To their credit it seems that IATA would like to work towards an equitable manner of inclusion and quantification.

Importantly, what I take from this approach is that (and it seems obvious when writing it now) an industry as large and as highly competitive as the airline industry, can deliver an environmentally friendly statement with associated targets in a simple but effective manner. Two targets and three methods of achieving these targets. I appreciate that agriculture or even livestock farming involves complex biological interactions, though surely we could agree simplified massages such as these, rather than always trying to account for every facet of our systems of production.

15.3 California truck stop

Whilst driving through California with Paul Martin (pictured below) of Western United Dairymen, we passed a truck stop, I noticed these big yellow tubes dropping from a gantry above the trucks and attaching to their windows. On closer observation, stopping, walking around and asking questions of truck drivers and the man with the clipboard we learnt the following:

- California has an airborne 'particulates' issue, which they are trying to address;
- when trucks stop, in the heat of California, they often kept their engines running to maintain a bearable temperature in the cab. The accepted fuel usage rate for this activity is 1 gallon of diesel per hour;
- the units at the end of the yellow tube, once the driver has purchased a fitting, connects to the cabin through the window;
- the unit provides air conditioning, television (including cable!), and computer based functionality such as e-mail, web etc. You can see in the picture, there are even USB ports!
- the cost of this service is always less than a gallon of fuel, though is considerably more environmentally friendly than the 40 or so trucks running their engines whilst idle…Smart eh!

I love this concept and acknowledge that sometimes in agriculture we try and look too deeply for the answers to our challenges, when often by looking a little wider the 'simple answers' are easily accessible.

Looking to other industries and understanding their approach to similar challenges such as climate change, their ideas are often, with a little tweaking applicable to our circumstances.

Paul Martin of Western United Dairymen holding the air conditioner/entertainment center on the left and a livestock truck with the system connected on the right.

16.0 Conclusions and Recommendations

I. Research investment

Much of the evidence for climate change currently being reported is based on complex modelling exercises. The fact that assumptions are being utilised, is no excuse for non-engagement. The cattle sector globally needs to encourage and engage with current and future research programmes to fully appreciate the outcomes and communicate these both within the sector and to external organisations. This understanding will assist in the engagement with policy makers and development of industry level activities. Effective knowledge transfer activities need to be designed so that cattle farmers can increasingly contribute to the changes necessary through effective adaptation of their businesses.

Research must also provide the necessary answers to enable agriculture to be included in carbon offsetting programmes. The research must provide the answers for those that engage with policy makers to make this become a consistent and accepted reality as opposed to the disparate programmes currently in operation.

II. Proactivity or legislativity?

Initiatives like the UK Milk Roadmap, the US Centre for Dairy Innovation or the Global Dairy Declaration, are real assets in demonstrating the proactive approach to important issues such as climate change. The farming community has a very simple choice, voluntarily work

alongside your industry representative bodies that are implementing these initiatives or be subjected to legislation.

Seeking longer term collaborative activities on a positive basis with government on core issues will only enhance the perception of government and the industry and open many other doors as a result.

III. Engagement by industry bodies

Industry organisations must capture the necessary information and actively engage with relevant bodies to ensure that the cattle sector is well represented and the latest science or industry based knowledge is available to decision makers.

Industry bodies must undertake these approaches from an industry perspective and not through a process that seeks to enhance the position of that particular organisation.

IV. Collaboration – domestically / internationally

If nothing else, this Nuffield journey has underlined the importance of collaboration. The sharing of knowledge and initiatives is fundamental to success. The UK is often better at sharing information beyond its shores than within. Better systems and a willingness to collaborate on precompetitive issues are paramount.

UK representative organisations on issues such as climate change need to collaborate to a greater extent and stop wasting industry funds on competing with each other seeking higher individual profiles. We will move much further forward as an industry and individually, if a collaborative approach is implemented.

V. Triple bottom line

Solving climate change must not be at the expense of social and economic (or welfare) needs of the business. So often governments have a single issue approach to dealing with challenges and do not appreciate the wider implications. The cattle sector must remove the blinkers of the policy makers and aid them in considering the wider picture. To do this they need robust evidence.

Farmers in their planning need to adopt this approach also. Simple system changes can result in major issues elsewhere in the business.

VI. Opportunities

I visited many farming groups who have engaged with the concept of proactivity and have managed to turn this to their advantage. The cattle industry needs to think holistically to embrace the wider opportunities and benefits that changes can bring.

The industry both domestically and internationally should seek to develop a sustainability logo with agreed standards associated with the triple bottom line of livestock production.

VII. Rewards for those who act responsibly

The current reporting inventory from the UK to the UNFCCC is not recognising the positive efforts the industry is putting in place. What this means is that on a global basis, there seems to be limited improvement in GHG emissions from UK agriculture. We need to look towards a higher, more complex, level of measurement that captures the change (positive actions) at farm level. Rewards need not be financial. If on national and international figures ruminant agriculture can see its contribution to the emissions of gases reducing, this will be a key benefit!

VIII. Consistency in consumer messages

Agriculture in general and the cattle sector in particular need to agree on their messages to ensure we are providing society with communications that are robust and consistent. This will transpire if we can get the collaborative approach applied.

IX. We have a good story to tell and it could be better

Emissions of nitrous oxide in agriculture have reduced by 23% and methane by 17% since 1990. Initiatives such as the Global Declaration, The Red Meat and Milk Roadmaps are all great examples of what the industry has achieved to date. Whilst we need to keep working at reducing these numbers even further, nevertheless we should ensure decision makers and the consuming public are fully appraised of our achievements and aspirations.

We can be a solution to, not a cause of, the climate change challenge!

17.0 Where has this study taken me as an individual?

I felt it important that I take some of this report to explain how Nuffield has played a vital role in elevating my career path to the next level.

As mentioned at the very start of this report, I started the study as Head of Research and Development for DairyCo. Through my early travels, I decided there was a real requirement for coordination and consistency for work in this important subject.

In discussions with other key global organisations in this field, I was convinced that they felt the same. So in the middle of this study, I took the plunge and resigned from my post at DairyCo and started my own livestock consultancy business, that would allow me to be free of bureaucracy and able to focus on this issue to provide resources where they were best needed to enhance understanding and bring organisations at whatever level or size together to share in this understanding and agree approaches to non competitive issues.

Credit must go to both the Global Dairy Platform and also the SAI Platform in seeing the bigger picture and agreeing with me that dedicated resource was required, on a global scale. Their encouragement and shared resource was and continues to a major driver for my work.

Since June 2008 I have not looked back and many who I met on my Nuffield study as experts, I am now proud to call my colleagues and continue to be in regular contact with them in my new line of work.

Nuffield provides the opportunity for you to break away from your everyday grind and appreciate the world from many different perspectives. The way I view the world now is very different to what it was before embarking on this wonderful opportunity.

18.0 Declaration

The views expressed in this report are most definitely my own and do not necessarily represent the opinions of the Nuffield Farming Scholarship Trust, The Trehane Trust, or any other sponsoring organisation or those I met with.

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20.0 Bibliography:

1. ***Transport Energy Strategy, 3rd Status Report of the Task Force to the Steering Committee***. August 2007.

2. ***Climate Chief: give up meat to save the planet.*** The Times Newspaper. October 27, 2009.

3. ***A Scientific Review of the Impact of UK Ruminant Livestock on Greenhouse Gas Emissions***. A. Hopkins and M. Lobley. 2009. University Of Exeter, Centre for Rural Policy**.**

4. ***The Environmental, Social and Economic Impacts Associated with Liquid Milk Consumption and its Production – A Review of Literature and Evidence***. October 2007 – Defra Project Code EVO 2067

5. ***Determining the environmental burdens and resource use in the production of agricultural and horticultural commodities***. August 2006. Defra project report – ISO205

6. ***Environmental Impacts of Food Production and Consumption***. December 2006. Manchester University and Defra.

7. ***A study of the scope for the application of research in animal genomics and breeding to reduce nitrogen and methane from livestock based food chains.*** April 2008. Defra Project Code AC204.

8. ***The UK's 4th National Communication under the United Nations Framework Convention on Climate Change***. 2006. Defra.

9. ***The environmental impact of dairy production:1944 compared with 2007***. Capper J.L. et al, 2009. Journal of Animal Science 87:2160-2167

10. ***The Carbon Footprint of British Agriculture, Options for Greenhouse Gas Mitigation in UK Farming***. C. Pollock. 2008. Nuffield Farming Scholarships Trust.

11. ***Carbon Footprinting and UK Horticulture Concepts and commercial relevance***. Edwards-Jones. G. 2008. The Horticulture Development Council.

12. ***Greenhouse Gas Protocol Initiative***. World Business Council for Sustainable Development and the World Resources Institute.

13. ***A Roadmap to reduce greenhouse gas emissions and increase business value***. U.S Dairy Sustainability Initiative. December 2008. The Innovation Centre for U.S. Dairy

14. ***The scary reality buried in Adair Turners report***. The Guardian.co.uk/environment/blog/2008/dec/01/carbonemmissions-climatech . December 2008

15. ***A model for estimating greenhouse gas emissions from livestock***. June 2004. Internal report for the Ministry of Food, Agriculture and Fisheries. Danish Institute of Agricultural Sciences.

16. ***The Economics of climate change.*** Turner A. February 2007. The Sustainable Development Commission

17. ***The England Milk Roadmap***. 2008. Defra http://www.defra.gov.uk/environment/business/products/roadmaps/milk.htm

18. ***Food livestock production, energy, climate change and health***. McMichael. A. J. Et al. September 2007. www.thelancet.com

19. ***Livestock's Long Shadow, environmental issues and options***. Stienfield H. et al. 2006 Food and Agriculture Organisation.

20. ***Agriculture and climate change: The policy context***. Policy Note. October 2006. World Resources Institute.

21. ***A Desktop Review of Greenhouse Gas Emissions***. 2008. DairyCo. Project reference number F08/019

22. ***Ruminant Nutrition Regimes to Reduce Methane and Nitrogen Emissions – A meta-analysis of Current databases***. Mills et al. 2008. DairyCo. Project Reference number MDC 07/04/A

23. ***A sustainable Dairy Sector***. Sevenster and de Jong. 2008. CE Delft, A report for the European Dairy Association.

24. ***Specification for the assessment of the lifecycle greenhouse gas emissions of goods and services***. PAS2050:2008 British Standards Institute.

Appendix 1

A GLOBAL DAIRY AGENDA FOR ACTION – CLIMATE CHANGE

DAIRY SECTOR POSITION:

Dairy products promote the good health and wellbeing of people in all countries of the world. The global dairy industry helps to sustain the lives of people and their communities, through the supply of products that deliver essential nutritional building blocks and through the provision of employment in both rural and urban communities.

The global dairy industry is a user of natural resources. At the same time it has a long history of providing stewardship of the land, air and water. The three dimensions of economic, environmental and social sustainability underpin a common approach by the industry, even though expressions of the concept of sustainability may vary.

The industry is committed to providing consumers with the nutritious dairy products they want, in a way that is economically viable, environmentally sound and socially responsible. Accordingly the industry has a shared interest in addressing the impact of climate change and in addressing the challenge presented by consumer demand and regulation to reduce greenhouse gas emissions throughout the supply chain.

Studies to date have estimated that cradle-to-farm gate emissions of milk globally contributes up to 3[1] percent of global greenhouse gas emissions. A significant source of emissions in the dairy supply chain is methane, produced from the natural digestive process of cows (known as enteric fermentation). Nitrous oxide and carbon dioxide are also by-products of dairy production.

There are many challenges associated with reducing emissions from ruminant animals and quantifying these reductions. The industry has invested substantial resources in research and development projects to reduce greenhouse gas emissions from dairy production. This investment is beginning to pay-off and opportunities to effect reductions are on the table. Many of these opportunities relate to improving efficiency of production. The industry is continuing to invest and will continue to identify new and innovative mitigation technologies and practices.

[1] "A Sustainable Dairy Sector, CE Delft, October 2008. It is expected that by the end of 2009 the current international study being carried out by FAO will bring greater precision to this measurement.

DAIRY SECTOR COMMITMENT:

Members of the dairy industry are committed to making a positive contribution to global action to address climate change. This is evident from the many initiatives established both on a domestic and international basis and reflected in the specific commitments of this Agenda for Action. In order to facilitate the industry's efforts to reduce greenhouse gas emissions and promote the long term sustainable supply of milk and dairy products, the global dairy industry will:

- Promote the development of a standard methodology framework for assessing the carbon footprint of milk and dairy products based on robust science;
- Promote adoption of world's best practices within the global dairy sector and actions that:
    - lead to the reduction of global greenhouse gas emissions from dairy production on a per unit of production basis
    - promote the use of technologies and methods that improve the processing and distribution efficiency of dairy products;
    - optimise economic, environmental and social outcomes for global dairy stakeholders,
    - recognise different levels of development and local conditions,
    - build on existing frameworks and knowledge, including for scientific advancement and technology transfer,
    - promote decision making based on robust science, and
    - complement initiatives in other areas of sustainability.
- Seek to advance the establishment of tools to facilitate measurement and monitoring of emissions both on-farm and in dairy manufacturing.
- Promote improved farmer understanding of agricultural emissions and opportunities to reduce greenhouse gas emissions on farm.
- Support sharing information and aligning research efforts to develop cost effective mitigation technologies for both on farm and manufacturing application.

This Agenda for Action has brought together the global dairy industry and its partners who are committed to pooling available resources, cooperating and working together to realise our goal of a more sustainable future. The industry is committed to engaging with all stakeholders in the dairy supply chain.

CALL FOR ACTION FROM POLICY MAKERS:

We seek the support of policy makers to provide a supportive regulatory policy environment in which the sector can deliver the above outlined commitments, without compromise to the dairy industry contribution to global nutritional and social wellbeing. Climate change policy frameworks must balance the need for emissions reduction with supplying nutritional outcomes

for the world's population. The importance of this balance is recognised in the United Nations Convention on Climate Change (Article 2).

We call on policy makers to:

- Recognise the nutritional, economic and social contributions of the dairy industry;
- Ensure that the intent of Article 2 of the United Nations Framework Convention on Climate Change – to avoid threats to food production - is appropriately reflected into future climate change frameworks;
- Maintain the use of robust science – both physical and economic – recognising the need to achieve long-term climate stabilisation in an economically optimal way;
- Recognise investments in science to develop mitigation tools as a contribution equal to emissions reduction

PARTIES:

Commitment to this Agenda for Action comes from a broad and representative group of global dairy sector participants and stakeholders. This recognises the role that all sector participants have in contributing to industry-wide and 'global-good' outcomes.

The following international and regional dairy organisations are signatories to this Agenda for Action:

- *IDF*
- *SAI*
- *GDP*
- *IFAP*
- *EDA*
- *FEPALE*
- *ESADA*

SPECIFIC ACTION:

In addition, industry stakeholders have made individual commitments to participate. Future participation remains open to, and will be welcomed from, other dairy sector stakeholders.

In support of the global dairy sector objectives, and in the spirit of co-operation and coordination, participants will undertake specific actions in a number of key areas as set out in the table below. An extensive list of actions and initiatives undertaken to date and

planned for the future are set out in Appendix: The Green Paper: Catalogue of Dairy Sector Initiatives in GHG reductions.

Key Areas	Examples
Emissions Reduction	Agricultural Emissions Research Optimising animal feeding Optimising use of fertilisers Optimising manure management
Energy Efficiency	On-farm energy use in milking and refrigeration Optimised processing Investing in renewable energy
Transport Efficiency	Optimised milk collections Optimised product distribution Optimised engine performance and driver training
Reduction in loss of milk and milk products	Shelf life improvements for fresh products Working with retailers and consumers to reduce household waste Energy capture from waste product
Resource Efficiency	Increase recycling of packaging Use of packaging with the lowest environmental impact Increase recovery of waste
Life Cycle Analysis and Management	Development of a global standard for measuring monitoring and reducing GHG emissions Working with FAO and ISO

Future Reporting:

Signatories and participants in this Agenda for Action acknowledge that this declaration of commitment is the first stage in the delivery of the above mentioned outcomes. We therefore commit to reporting progress on a regular and transparent basis. The first such report will occur 24 months from the date of signing and biannually there after.

This Agenda for Action is intended as a living document that will evolve with the industry and with current science. As such reporting will include not only measurable and verifiable progress against existing commitments, but also new commitments and acknowledgement of new participants.