



# Strategies for Reducing the Climate Impacts of Red Meat/Dairy Consumption in the UK



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## Foreword

“Although we Brits are famous for our obsession with the weather, there is at least one other area of our lives with which we have a closer relationship - food. We probably spend more of our time planning, shopping for, preparing, eating and clearing away meals than we do on anything other than working and sleeping. For us, food is far more than a way to maintain healthy, vigorous bodies and minds: it is the symbol and focal point for a wealth of familial, social, cultural and religious celebrations; it is a predictor and product of our geographic, social and economic background; it is the subject of media entertainment and public campaigns; it is the stuff of habit; it is a statement of who we are, both individually and collectively. The link between our food and our weather is far more significant than most people realise. The consumption of food is responsible for around a fifth of the UK's greenhouse gas emissions and climate change itself affects the amount, types and quality of food available to us in our shops, gardens and restaurants.

Even small changes in our food-related behaviour can have a powerful influence over environmental outcomes, such as climate change, water availability and quality, and biodiversity. As part of our One Planet Food initiative, WWF-UK is working to understand these complex inter-relationships better. We intend to help guide and support the development of a food system that can fulfil the UK's nutritional, social and religious needs, without degrading the natural environment or endangering wildlife. For example, we believe that our food system needs to reduce its greenhouse gas emissions by at least 70% by 2050 to do its part in averting irreversible and catastrophic climate change. Since the majority of these emissions arise before our food reaches the shop, we need to make agriculture and food processing more climate-efficient; furthermore, since what we choose to consume largely determines what our farmers produce and what we import, we also need to change our consumption habits and avoid waste.

To further inform One Planet Food, we asked Imperial College to consider how the UK food system might be used or changed to make the consumption of red meat and dairy more climate-friendly. With more time and resources, we would have asked them to look further - at all foods, and for impacts on water and biodiversity - and to consider trade-offs with other important human needs and tastes, such as the appearance of our landscape. (Cows and sheep produce more greenhouse gases than pigs or chickens, but their absence would have a far greater impact on our landscape, since much of our pastureland would disappear.) Within these boundaries, however, we asked them to consider the cultural, religious and nutritional implications of changing to a more climate-friendly diet.



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We were impressed and intrigued by Imperial's findings and recommendations. In particular, we were struck by the insight that healthier diets also seem to be better for the climate. Whilst our understanding of what represents 'One Planet Food' is complex and still evolving, we felt that this report would make a valuable contribution to the debate.

If you would like to find out more about One Planet Food, please contact Mark Driscoll, One Planet Food lead at [mdriscoll@wwf.org.uk](mailto:mdriscoll@wwf.org.uk).”

Anthony Kleanthous, Senior Policy Adviser, WWF-UK



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## Executive Summary

This report is an investigation into possible strategies for reducing red meat and dairy consumption in the UK to cut greenhouse gas emissions (GHG) from the food sector, with particular focus on the role of the multiple grocery retailers. We believe that this study provides new and useful insight into the orders of magnitude relating to reductions in GHG required and the potential solutions to deliver these reductions at a time when there is urgency to tackle the role of food in climate change at a national and global level. The work was performed to a brief from the Worldwide Wildlife Fund (WWF) that specifically asked us to consider strategies for reducing red meat and dairy consumption to contribute towards their target to reduce GHG emissions from the UK food economy 25% by 2020 and 70% in 2050, based on 1990 levels, as detailed in their One Planet Food strategy. The overall goal of the WWF strategy is to ensure that;

“By 2050 the consumption of resources and the emission of GHG arising from the production of food for UK consumption are at sustainable levels and the adverse impact of food production in the key areas of biodiversity impacted has been restored” (WWF 2008, p.2).

In order to complete the project objectives, we have analysed the UK food market and its impact on climate change. We used the results to identify the GHG reductions required to meet the targets laid out in the One Planet Food Strategy. We also reviewed the policy context, and actions taken by farmers, processors and retailers to tackle climate change to date, identifying further potential GHG reductions in the supply chain to 2020 and 2050. This allowed us to calculate the “gap” to be made through changes in consumption, and we conducted a detailed review of consumption patterns and consumer attitudes towards food, ethical consumerism, and red meat and dairy, to develop a series of options for reducing consumption. We evaluated these against their likely impact, adoption and ease of implementation. This allowed us to prioritise actions for WWF to request of retailers and to outline actions for Government to facilitate the process.

Our first key finding is that in order to achieve their target, WWF should aim for a GWP reduction of 8 MTCO<sub>2e</sub> by 2020 and 32.7 MTCO<sub>2e</sub> by 2050. Our analysis of emissions reduction potential in agriculture and other non-consumption components of the food value chain indicate that all of the target could be met this way by 2020, and a significant proportion of the target (83%) by 2050: the supply chain alone could deliver projected savings of 10MT CO<sub>2e</sub> and 27MT CO<sub>2e</sub> respectively. This highlights the importance of achieving reductions upstream in the supply chain, but also leaves a “gap” of 5.7MT GWP CO<sub>2e</sub> to be achieved by consumer change by 2050.



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Our analysis of the policy and business context points to multiple initiatives relating to environment and sustainability across the various players in the red meat and dairy food chain, but that they tend to be related to single and ‘emblematic’ issues (WWF, 2008), such as organic, animal welfare or fair trade and do not go far enough, or fast enough to tackle climate change effectively. Meanwhile, consumer adoption of environmental behaviours is also slow and centres on easy and convenient actions. A recent DEFRA report showed that adopting a “low impact diet” was the action people were least likely to do out of twelve possible pro-environmental behaviours, even though they were able to make the changes easily (DEFRA, 2008c). But since there is currently no vision of what a “sustainable diet” should be in the UK (Garnett, 2008), it may be difficult for people to understand and act on what is meant by a “low impact diet”. This is complicated by the crowded and often conflicting range of communications about diet, such that ‘people are confused about what foods they can eat’ (FSA, 2007a). Historically, the emphasis by policy makers and consumers alike in relation to food has been on weight management. We see a need to integrate nutritional and environmental messages, rather than have them compete.

Our research into consumer attitudes illustrates that both red meat and dairy are core products in the diet and lives of British people, with long standing associations of goodness, pleasure and natural health. At the same time, and paradoxically, there are growing numbers of consumers who, for perceived health reasons, are attempting to reduce their intake of meat and dairy. Meanwhile, top down consumption analysis indicates that people eat more than is required or recommended according to the government’s Eat Well plate, with over-consumption of 98 % for red meat, and 44% for dairy (app. 11.1). This implies that, together with supply chain improvements, we could reduce consumption by enough to achieve the 2020 GHG emissions targets twice over without any nutritional deficit, if we could persuade consumers to change their eating patterns in line with current government guidelines. To meet 2050 targets we would need a combination of technological advances and consumption reduction.

In addition, we evaluated a range of product and occasion based levers to reduce consumption of red meat and dairy and prioritised them for impact and do-ability (app.11.7). This analysis illustrates that the options that provide the biggest potential saving are the increased availability of non meat/dairy substitutes and more widespread control of portion size in meat-based ready meals. In fact, the combination of all our suggested changes more than meets the long term GHG emissions “gap” with a potential saving of 18MT GWP CO<sub>2</sub>e in 2050, versus the requirement of 5.7MT CO<sub>2</sub>e. Moreover, our top three consumer actions alone would also fill the “gap” such that the combined action of these and technological changes could meet the 70% reduction target for 2050.





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From a retailer point of view, red meat and dairy are core revenue streams and, for several, these categories are key to the brand 'offer'. As a result, retailers are reluctant to reduce consumption amongst their customer base. This is not to say that climate change and the environment is not a concern as many are already taking significant steps to reduce the environmental impact of their stores, office operations and logistics, with initiatives to improve energy efficiency, and reduce or eliminate landfill waste. Indeed most retailers source the large majority of their red meat and dairy products from British farmers and have programmes of collaboration around what they refer to as "sustainable farming". However, the primary focus to date has been on farm assurance or issues of animal welfare. If the UK is to achieve reduction in these food categories, we believe that retailers have a key role to play. Five priority commitments for retailers would be:

- (a) Drive a transformation to 'low carbon, sustainable farming' through their supply chains;
- (b) Create 'portion awareness and labelling' for red meat, dairy and their direct substitutes;
- (c) Create viable alternatives at scale through innovation in new proteins and milk types;
- (d) Drive an uptake in vegetable based meals, through recipes, range and promotion; and
- (e) Raise the bar on operational sustainability to set higher, faster targets.

We believe that Government also has a key role to in enabling market transformation with strong long term signals to farmers, retailers and consumers alike. They should:

- (a) Strengthen and update the FSA nutritional guidelines to support both nutritional and One Planet Food concepts, defining and publicising a "Live Well" plate;
- (b) Provide clarity on lifecycle analysis boundary scope and methodology requirements for red meat and dairy to accelerate foot-printing amongst retailers and their suppliers;
- (c) Catalyse the reform of farming to support GHG reduction and sustainability, including acceleration/refinement of environmental stewardship under the CAP, provision of a bio-methane equivalence infrastructure, and the setting of a clear direction and vision for farming of the future;
- (d) Include farming in national GHG targets and lobby for international agreement to do the same;
- (e) Revisit taxation of food to incentivise adoption of healthy and sustainable foods

Furthermore, we believe that the complexity and interdependency of today's issues and the speed with which change must be affected will require a new form of collaboration in the food market, with a greater degree of open-mindedness and creativity than at any point in the past. The



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government should foster a debate to allow “back-casting<sup>1</sup>” in the broad set of stakeholders and support a move away from the typical adversarial stance of players in the market, to one of collective purpose and vision.

## 1. Introduction

### 1.1 Brief for the Project

WWF posed our team a core question: ‘How should the UK food market be used or reformed to reduce red meat and dairy consumption in the UK to a level consistent with WWF’s One Planet Food Strategy?’ They asked us in particular to consider the following aspects:

- Current patterns and levels of food consumption in UK;
- Cultural, religious and health-related aspects of diet;
- The changes in consumer behaviour and business practices that may be necessary;
- Current and envisioned business models, imperatives and strategies;
- Anticipated and desired changes to legal and regulatory frameworks.

WWF’s One Planet Food Strategy aims to reduce GHG emissions from the UK food economy by 70% by 2050 based on 1990 levels, to eliminate unsustainable impacts on water as a result of food destined for UK and to change trading patterns so that UK food makes a positive contribution to WWF priority biodiversity places, especially Amazon, Borneo, Papua New Guinea, Choco Darien, and North East Atlantic (WWF, 2008). Given the short time frame for our project, however, we agreed that our approach would be to address the core issue of climate change through GHG emissions relating to red meat and dairy, and then consider implications for water and biodiversity at a high level only.

The issue of food and its impact on society and the environment has been forefront in recent years, driven by concern about the need to feed an increasing global population, unsustainable environmental degradation and climate change. In particular, the UK food chain is responsible for a high level of national GHG emissions with contributions throughout the value chain, from agriculture, to processing, distribution, retailing, cooking and consumption, and disposal. European studies have highlighted that red meat and dairy products are the most onerous because of the GWP of red meat and the large volumes of meat and dairy products that are consumed as part of a typical European diet (European Commission, 2006). Garnett outlines the key issues in her study, highlighting the impact of high levels of nitrous oxide emissions and embedded carbon relating to fertilisers, methane from

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<sup>1</sup> “Back-casting” is central to a strategic approach for sustainable development. It is a way of planning in which a successful outcome is imagined in the future, followed by the question: “what do we need to do today to reach that successful outcome.” (Blekinege Institute of Technology, 2006).



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ruminant animals at the farming stage, as well as carbon dioxide from fuels used to power farm machinery and energy used for distribution, and refrigeration in stores and in the home. Indeed, Garnett notes that there are additional emissions relating to deforestation or other land use changes overseas, in particular, to allow production of feedstock, which are not directly considered in this report but exacerbate the impact of red meat and dairy on the environment. Garnett also indicates that there is potential to reduce GHG at each stage of the value chain but concludes that ‘technological development on their own are not enough’ and that ‘changes in behaviour – in what and how we eat – are essential’ (Garnett, 2008). Food is a complex topic, involving many stakeholders including government, scientists, farming, businesses, consumers and media (UK retailer, 2009, b). Our research examines the current status of the key ones, followed by a detailed analysis of consumers and retailers. We also draw on a wide range of analysis relating to the GHG impact of each stage of the value chain, and estimate potential reductions over time, to compare the reduction potential to that targeted by WWF.

A key part of the brief was to make recommendations on the “asks” for the retailers and we outline what we feel is a pragmatic programme of actions which provide “stretch” for the retailers without being outlandish. However, we recognise that business requires strong direction and a level playing field, so propose some priority actions for government to enable speedy progress. Together we feel these might reasonably form the basis of a collaborative transition, which can be quickly actioned and has the potential to make significant long term impact.

For many years, the agenda around food has been based on ‘food security... farming and health’ but this is rapidly changing and new issues are emerging such as ‘carbon and climate change, consumer labelling, fair trade and localism’ (Lang, 2008). Although government and retailers alike have completed or commenced research into the impact of food on the environment, to our knowledge, none have yet attempted a holistic assessment, nor to address a change in consumer behaviour. We believe that the focus of this report is, therefore, of urgent importance and hope that it will go some way to fill that gap.

The report is structured as follows: chapters 1 and 2 provide details of the project background; chapters 3 to 6 outline our research and findings of current practices, treating each of our work streams in turn - the red meat and dairy markets, government policy and practices, consumer profile, behaviours and attitudes and retailer profiles and practices; chapter 7 relates to our work on options and impact assessment and chapter 8 details our recommendations for change in the food market.

### **1.2 Methodology**

This research forms part of the Imperial College MSc in Environmental Technology and was conducted over nine weeks from January to March 2009, with a time allocation guideline of one day per



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week. Therefore we followed a very structured approach to ensure best quality of results and time effectiveness. Early in the project we defined a classic five-step approach (Jackson, 2009): scope definition; analysis of current practices; solution definition and evaluation; and synthesis of our findings.

The broad scope of the original project proposal, the complexity of the issue itself as well as the time restrictions of our research led us to set clear boundary specifications and adopt disciplined project management. We also decided to adopt a “divide and conquer” approach throughout the project, with individual team members owning specific areas of research or analysis, and with structured team workshops to share and debate findings, to arrive at insights and our conclusions.

Initially, a kick-off meeting was held to understand and align on the project’s principal requirements, followed by an initial meeting with our sponsor to confirm WWF’s expectations. At this point, we clarified that our focus was red meat (beef and lamb) and dairy, with primary concern for their impact on climate change (albeit conscious of WWF’s other goals relating to water and biodiversity), and that our focus was consumption levels, rather than production, since Britain also exports significant quantities of its national beef, lamb and dairy production.

We conducted a complete literature review of documents provided by WWF to categorise them against specific work streams and supplemented this with research of our own: primary research was conducted via a series of telephone-based interviews with Corporate Social Responsibility (CSR) and food representatives in key UK retailers (app.11.3); secondary research comprised an extensive review of policy papers, scientific studies, market and consumer reports, as well as company websites and other internet resources. A comprehensive presentation of this analysis was reviewed with our sponsor at an interim meeting and is available upon request. Comments and suggested revisions were incorporated in our report in the form of corrections and adjustments.

To define and evaluate potential options for reducing GHG from red meat and dairy, we established a solid quantitative baseline, and then considered technological improvements through the supply chain, as well as both top down and bottom up measures for consumptive reduction. In particular, for the latter we found it helpful to define a hypothetical “lever tree” outlining the actions which would result in lower levels of consumption and the retailer interventions which would enable/encourage these early in this stage of the project (app.11.7). Our subsequent analysis refined each, testing their viability and assessing the likely impact and ease of implementation for each. Finally, we aggregated all improvement opportunities and conducted a variance analysis against the target reduction in 2020 and 2050. We reviewed the quantitative results from our model, in light of all the



current practice to arrive as a set of “asks” for the retailers and a list of required policy enablers to bring about the reductions required in the food market.

Given that this is a complex topic, where the measurements are constantly being updated, and that WWF or other parties may wish to build on our work, we have deliberately laid out additional methodology details at the beginning of each section in the report. We recognize some limitations in our analysis: first we have primarily considered improvements within components of the value chain, rather than across the whole, yet we believe that there are potentially more creative, win-win solutions spanning players if a deeper and more open level of collaboration could be established; second, we have not considered in any detail broader sustainability issues including water stress and biodiversity. In particular, it will be important that direct substitutes for red meat and dairy are in and of themselves sustainable, so as not to have us move “from the frying pan into the fire”. Nonetheless, we hope and believe that our findings will make a positive contribution to the debate and accelerate a clearer course of action.

## 2. Background

### *2.1 The Food Sector and Climate Change*

Given the central role that it plays in society around the world, it is perhaps unsurprising that the production and consumption of food makes a significant contribution to climate change. This is especially true in the UK, where a developed food retail industry – worth over £58 billion in 2005 (ONS, 2006) – draws on a global supply chain to deliver foreign produce that makes up 40% of total food consumed (Defra, 2008). The issue of food and climate change is therefore a global one involving globalised markets and supply chains. Indeed, the UK both imports and exports red meat and dairy produce. This is significant considering the One Planet Food strategy goals apply to ‘UK-bound’ foods. Our research therefore reflects this, focusing on consumption rather than production volumes. However, and since only 28.5% of red meat and 5% of dairy produce consumed is imported, we have treated these categories as if they were sourced from the UK for the purposes of evaluating the associated environmental impacts.

Attempts to quantify the GHG emissions arising from food-consumption related activities are currently few and far between, with most attention falling solely on the agricultural stage of the food chain. However, research conducted by the Food Climate Research Network (FCRN) estimates that



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approximately 19% of UK consumption-related GHG emissions stem from food consumption, equivalent to 159 MTCO<sub>2</sub>e (Garnett, 2008), (app.11.14).

### 2.2 A Focus on Red Meat and Dairy

We may well have included all meats in the analysis, given that our calculations revealed 44 MTCO<sub>2</sub>e, or around 28% of the total food sector footprint, is taken up by meat consumption over the full lifecycle. However, it was apparent that within this 44 MTCO<sub>2</sub>e, 29 MTCO<sub>2</sub>e (or 66%) emanates specifically from red meat i.e. beef and lamb. This comes in spite of red meat only accounting for 30% of total meat consumption – a clearly disproportionate amount when compared to its GHG (figure 1).

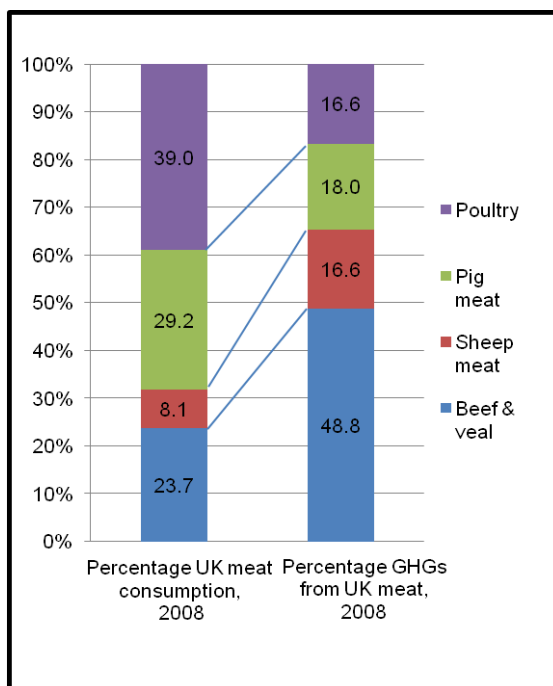


Figure 1: The disproportionate GHG impacts of the primary meat categories relative to their consumption

Rather than being a product of the relative energy used in primary production, it is understood that beef and lamb are considerably more GHG-intensive owing to the ruminant digestion processes that produce methane, and the pasture fertilisation process that releases nitrous oxide. These powerful GHG have Global Warming Potential (GWP) values 23 and 296 times that of CO<sub>2</sub> respectively (Defra, 2008b). This results in a wide variance of GHG emissions from red and white meats i.e. poultry and pork (app.11.13). For example, the GWP of lamb is five times that of poultry, despite having a roughly equivalent energy input per unit weight. As a result, red meat (beef and lamb) is responsible for a total of 28.7 MTCO<sub>2</sub>e over the lifecycle, or 19% of the GHG arising from total UK food consumption.



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Dairy produce has a much lower GWP value in comparison to the meat categories, in particular to that of red meat (app.11.13). This is primarily because the GWP values for dairy are given per unit weight of liquid milk: to obtain the dry matter equivalent the GWP should be multiplied by a factor of ten. Furthermore, dairy produce has a concerning scale of climate impact owing to it being consumed in such large quantities. Dairy consumption is responsible for a total of 19.5 MTCO<sub>2</sub>e over the life cycle, therefore comprising 12% of the GHG arising from total UK food consumption.

Our estimates for the impact of dairy are based on the assumption that the GHG emitted reflect solely the GWP of liquid milk input for each commodity. While this is less of a concern for liquid milk commodities, there will be at least some additional GHG emitted in the dairy produce manufacturing processes. We believe ours to be both a necessary assumption given the lack of data available regarding the GWP of each dairy based products, and a safe one in light of research demonstrating that, taken on the whole, approximately 90% of the GHG for all dairy produce arise from primary production stage (MBS, 2006).

## **2.3 Section Summary**

Our estimates show that red meat and dairy produce together account for 31% (19% and 12% respectively) of the total food sector GHG emissions, and there is clear rationale for focusing on reducing the impacts of these foods in particular. This is particularly true of red meat, which has a highly disproportionate climate impact. While dairy produce is far less GHG intensive per tonne, as a liquid it is consumed in far greater quantities and consequently incurs a climate change impact significant enough to warrant inclusion in any drive to reduce the emissions emanating from the food market as a whole.

Furthermore, and if we assume at this early stage that some element of change is required in consumer behaviour, it is apparent that whereas red meat has direct substitutes available (i.e. other meats with lesser GWP), such an alternative does not exist within the dairy categories. Therefore attempts to reduce consumption of dairy produce may hinge on the availability of viable, non-dairy alternatives and we explore that further later in the report.

## **3. Food Market**

### **3.1 Methodology**

The primary aim of our research in this area was to gain an understanding of two core areas: i) the industry structure, value-chain players and key stakeholders that make up the UK red meat and dairy markets; ii) its size and long-term market trends. Our intentions were to identify those stakeholders with sufficient influence to potentially assist in achieving WWF's strategy goals, to determine whether there



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were any products within the red meat and dairy category which were large enough to be singled out as the key focus for action, and to estimate the future course of meat and dairy consumption in order to assess its environmental impact if no action were taken. This was achieved largely with desk-based research, paying particular attention to market data resources such as TNC, Mintel and MDC Datum.

### **3.2 Industry Structure and Stakeholders**

The industry structures for both red meat and dairy follow a broadly similar value chain. This begins with primary producers who supply processors and manufacturers, before the produce is sold either to retailers or the food service industry. Waste services then follow consumption. (Defra, 2006). In addition to the value chain, external stakeholders exert an influence over the industry. The main influences come from national government who regulate over all stages of the value chain, and EU directives such as the Common Agricultural Policy (CAP). In addition, medics and scientists influence the government as well as the value chain players, especially consumers, either directly or via the media (Prior, 2001).

Within the value chain, domestic rearing of beef and lamb takes place in a highly fragmented industry. In contrast to other meat sectors such as poultry, where the bulk of production and processing is consolidated in the hands of six companies, beef and lamb is reared in the UK by over 100,000 holdings (MLC, 2008). Beyond the farm gate however, there is greater consolidation amongst processors and retailers. ABP, Grampian, Dawn, and Hilton share 64% of the beef processor market for retail, while Grampian, Dunbia, Hilton and Romford share 60% of the lamb processor market (MLC, 2008). 86% of beef and 85% of lamb then continues its route to market via retail, with the six largest multiple retailers accounting for c.80% of total retail sales by value – representing an 11% increase since 2000 (MLC, 2008).

The dairy farming industry has undergone significant consolidation since 1996, when there were approximately 22,000 dairy farms. As of 2008, there were a total of just 10,000 (Defra, 2008c). The processor stage of the dairy value chain is also dominated by just seven companies who account for 90% of production. The largest of these are Arla, Robert Wiseman Dairies and Dairy Crest. Multiple grocers account for 65% of milk sales in the UK although higher in butter, cheese and yoghurt (c 80-85%). The largest retailers often align themselves with just one processor.

### **3.3 The Size and Trends of the UK Meat Market**

Within the beef category, figure 2 demonstrates that there are no types of beef product that deserve special attention in any efforts aimed at reducing overall beef consumption. For lamb, chops





# Strategies for reducing the climate impacts of UK red meat/dairy consumption

and roasts account for more than half of the market, but since lamb is a relatively small volume of the total red meat market we have decided to address all red meats as a whole.

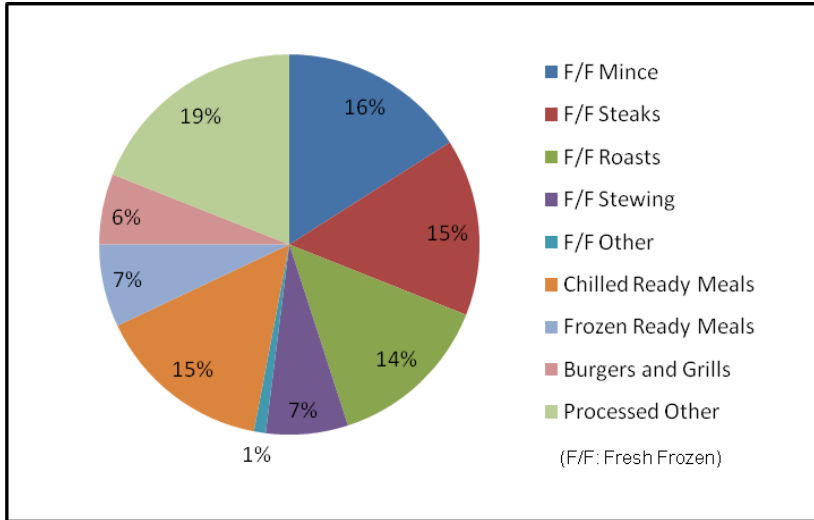


Figure 2: Beef consumed in the home in the UK (by value) 2008 (Source: UK Yearbook 2008, Meat and Livestock Commission)

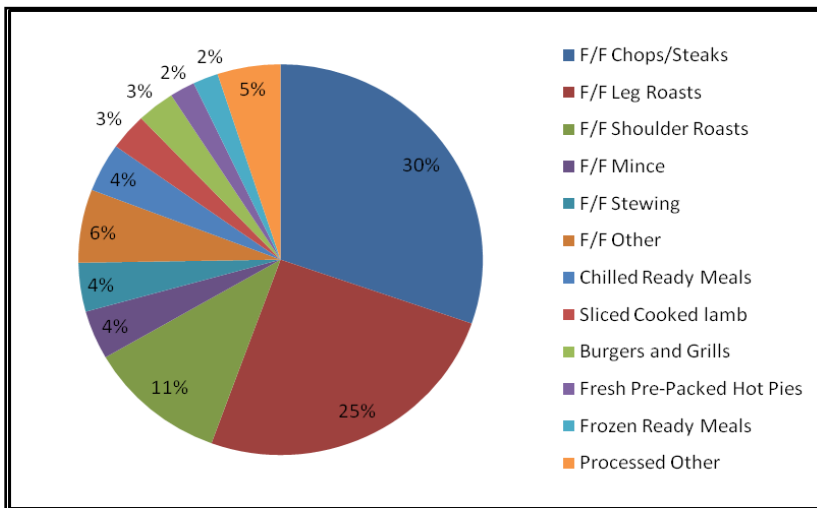


Figure 3: Lamb consumed in the home in the UK (by value) 2008 (Source: UK Yearbook 2008, Meat and Livestock Commission)

Our estimates of the environmental impact of meat and dairy in the UK are a product of impact per unit weight consumed multiplied by the total weight consumed. Research into market size and dynamics therefore play a pivotal role in these estimates, as well as highlighting changes in consumption over time. Recorded market trends – from the strategy base year of 1990 to present – informed our forecast consumption levels in 2020 and 2050. As illustrated by figure 4 volume consumption of red meat in the UK has increased by 14% over the period 1990-2007 (MLC, 2008) or a combined CAGR of



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+0.32%. Growth in expenditure and population lie at the heart of this, with per capita consumption rising 10% over the period; implying that the remaining 4% of growth can be attributed to population expansion (MLC, 2008). However, this growth rate hides divergent underlying trends for beef and lamb.

Of all the meat categories, sheep meat (which is only 26% of combined beef and lamb) was the only one to experience a fall in consumption over the total period with a compound annual growth rate (CAGR) of -0.66% (see figure 4). This is partly explained by the outbreak of animal diseases. Sheep meat consumption witnessed a decline of 14% between 2000 and 2001 due to foot and mouth disease (FMD). Similarly, in the early 1990s BSE adversely impacted beef and veal volumes, which declined over 25% between 1990 and 1996 before recovering over 50% between 1996 and 2007 but overall beef growth has outweighed the declines giving it a long term CAGR of +0.65%.

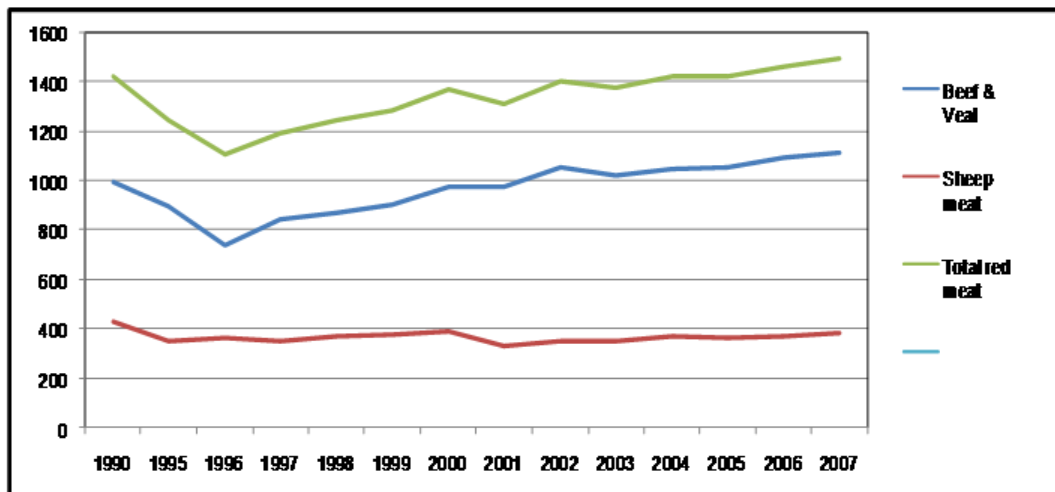


Figure 4: Trends in UK meat consumption 1990-2007 ('000 tonnes) (Source MLC, 2008)

As we have used growth patterns over this period as the basis of extrapolated consumption forecasts, it is worth noting the possible distortionary impacts of such episodes. Sheep meat consumption, for example, has recovered by the same margin (14%) since the last major FMD outbreak in 2001, with 2005 the only exception to year-on-year growth. However, given the complexities of attempting to factor-out such impacts with a limited time period available, we chose to avoid this and use the CAGR from the whole period.

### 3.4 The Size and Trends of the UK Dairy Market

As illustrated in figure 5, 80% of UK raw milk production is consumed in the liquid milk and cheese categories, taking up 53% and 27% of milk utilisation in 2007/8 respectively (MDC Datum, 2009). This analysis led us to focus our attention for reducing the environmental impact of dairy produce primarily on the liquid milk and cheese categories.



## Strategies for reducing the climate impacts of UK red meat/dairy consumption

Our figures account for net imports of liquid milk, but not of manufactured dairy produce but we feel they are robust enough to use since imports amounted to less than 5% of that sourced from within the UK (Dairy UK, 2007). In light of the minor role played by net imports of manufactured dairy produce, and given that we specifically required liquid milk input data in order to calculate the associated GHG emissions of the dairy sector (section 2.2), we have assumed that UK liquid milk input, inclusive of net imports of liquid milk, serves as a proxy for total liquid milk input for UK dairy consumption.

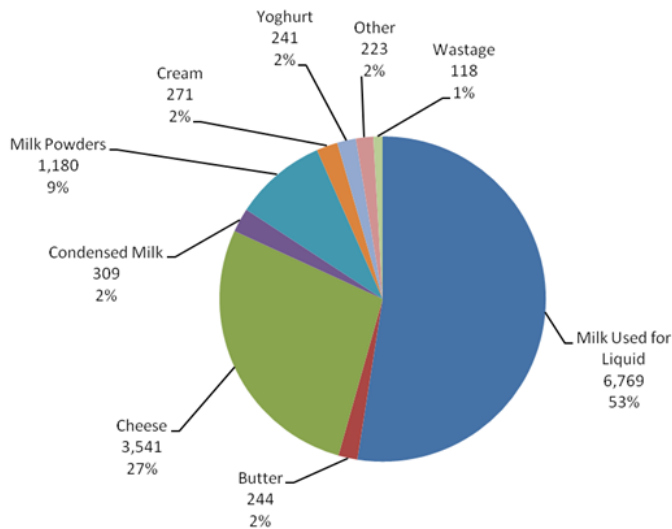


Figure 5: Utilisation of milk by UK dairies, 2007/8 (million litres of raw milk) (Source: MDCCatum, 2009).

As illustrated in figure 6, dairy consumption as a whole fell over the period 1990 to 2007 by a CAGR of -0.59%. This largely reflects a CAGR of -0.07% for liquid milk – the single largest dairy commodity consumed by volume although cheese consumption has shown relatively strong CAGR growth levels of 0.8%. However, the negative CAGR for all dairy since 1990 means that our consumption forecasts show a continued decline towards 2020 and beyond to 2050 (app.11.13).

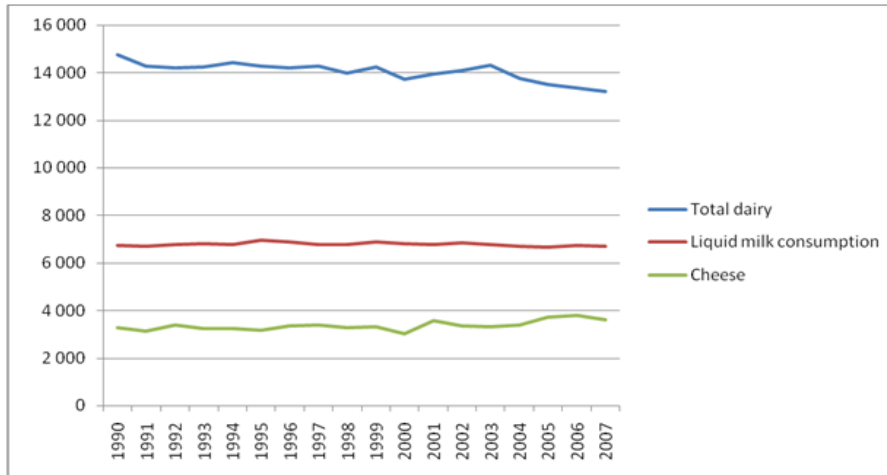


Figure 6: Trends in milk consumption, 1990 - 2007 (million litres) (Source: Defra, 2008)

### 3.5 Implications for Red Meat and Dairy Consumption Reduction

Our value chain analysis illustrates that there are multiple players with influence in the food chain for red meat and dairy, but that the retailers represent a “gateway” between consumers and producers, and are sufficiently concentrated that dialogue is realistic. Further, our market analysis demonstrates that liquid milk and cheese are key products in the dairy market, whilst red meats are fragmented and should be treated as a whole. It also shows that since 1990 red meat has increased whilst milk is in long term decline: both these trends are expected to continue in the future time horizon we are considering in this project.

## 4. Policy Context

### 4.1 Methodology

The team undertook an extensive review of governmental policy papers, reports and legislation as well as non-governmental organization (NGO) papers and briefings to understand government policy on farming and food. Food and farming are mainly the responsibility of the Department for Environment, Food and Rural Affairs (Defra) and the Food Standards Agency (FSA). Responsibility for climate change resides with the newly formed Department for Energy and Climate Change (DECC). We focused our research on the activities of these departments and the Cabinet Office. We also felt it pertinent to explore differences in policy within the Conservative party, given that a UK general election is imminent and a change of party possible. For the issue of health, the team reviewed documents relating to the government’s long history of trying to tackle obesity, a priority issue for the Department of Health (DH), as well as nutritional guidelines and strategies from the Food Standards Agency (FSA).



### 4.2 Current Status

It is evident that farming is in a period of significant transition and will need to undergo radical change in the next 40 years. In the foreword to the Sustainable Development Commission's report, "Green, Healthy and Fair", Professor Tim Lang explains:

"For 60 years since the 1947 Agriculture Act, the overarching tenet of UK food policy has been to ensure that enough food is available, affordable and accessible. Today in the era of climate change, oil dependency, looming global water shortage, fish-stock crises, biodiversity and public health challenges, to aim purely for [this] would be hopelessly inadequate." (SDC, 2008)

This view is shared by the current Labour government and last year The Government Office for Science launched a new Foresight Global Food and Farming Futures programme (Government Office for Science, 1999). Moreover, The Cabinet Office's recent "Food Matters" report (Cabinet Office Strategy Unit, 2008) lays out "the major issues facing the food system in the UK" and the role of on-farm GHG.

In addition, DEFRA is currently working with the Carbon Trust and the British Standards Institute to develop a methodology for measuring GHG impacts across their lifecycle and has already completed a lifecycle analysis (LCA) for certain food types, notably milk (DEFRA, 2007). Under the CAP, current EU law requires every European Member State to transition funds from Pillar I, which pays farmers for "headage" of cattle, to Pillar III which makes payments for environmental "services", such as water quality, soil erosion, hedgerow management (Potter, 2009). Despite this, the CAP has been heavily criticised for failing to protect the environment from over productive, intensive farming practices (Jeffery, 2003) and it does not include actions to address climate change.

All this points towards a relatively advanced understanding of the issues and a strong desire to tackle them within the current government. Indeed, the Food Industry Sustainability Strategy (FISS) set a challenge to food companies and retailers (ahead of regulation) in relation to various environmental improvements including a CO<sub>2</sub> reduction of 20% by 2010 v 1990, waste reduction of 15-20% by 2010, and water consumption reduction of 10-15% by 2020 (Defra, 2006). However, we sense that the government is still trying to get to grips with the emergent and complex interdependencies, and has not yet arrived at a concrete direction, plan of action, nor integrated these issues into the wider climate change agenda. In part, this is due to the necessity to focus on energy, the single most important factor in meeting the national GHG targets. On this topic the government has been active since the early 2000s, with the introduction of multiple legislative bills around carbon emissions and seeking to support a transition to non-fossil fuelled energy, such as the Renewables Obligation (RO), Climate Change Agreements (CCAs) (Defra, 2009) and the first national Climate Change Act (The Office of Public Sector



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Information, 2008). For our study in particular, it is worth noting that both the red meat processing and the dairy sectors have had CCAs in place since 2001, and that the retailers are aware that they will be included in the upcoming Carbon Reduction Commitment (CRC). However, even here, the focus has been narrow and focused on CO<sub>2</sub>. We believe that the government should now extend this to total GHG measurement and abatement.

It is instructive to also consider the Conservative direction around climate change and the environment, since there must be a General Election before spring 2010 which might foreseeably herald a change of party. Discussion with Adrian Gahan, Climate Change Policy Adviser to the Shadow Secretary of State for Energy and Climate Change, and a review of the Conservative party green paper on “The Low Carbon Economy” (Conservative Party, 2009) reveals that there is no direct policy around the food market or agriculture. In the main, they lay out how technologies, the physical infrastructure and transformed financial incentives can shape the transition to a low carbon economy encompassing not only a decarbonised, decentralised and “smart” energy sector, but also a move to electric vehicles. We believe that their 36 point proposal is broadly on the same trajectory as the Labour government. Perhaps more important, however, is the Conservative party desire to provide access to national gas networks for agricultural areas, enabling farms to convert waste using anaerobic digestion and sell it on the gas market through bio-methane equivalence.

For this report, we have analysed current status and thinking on health and nutrition in UK. We feel this is important, given that diet plays a large role in people’s cultures and lifestyles and since the government’s approach to diet provides insight into some of the opportunities and challenges for changing the public’s diet based on environmental grounds. Obesity and health-related diseases are an increasing social problem in the UK and it has been estimated that the cost to the National Health Service (NHS) is approximately £4.2 billion (Department of Health, 2008). The government has been trying to address the issue since the early 1990s but early attempts to tell people how to live and eat were met with a backlash and claims of “the right to be fat” and violation of human rights. As a result, it underwent a year-long National Audit on Obesity (NAO, 2001) and has more recently conducted scientific studies using new techniques to understand the “complex systems” of obesity, as well as deep consumer insight into attitudes to family eating, which has allowed a more targeted and impactful campaign. The ‘Change4Life’ initiative, launched this year (Department of Health, 2009) is seeking to reframe the issue by engaging parents towards an active lifestyle and healthier diet for their children.

Alongside this, in 2008 the government updated its diet guidelines based on the ‘Eat Well plate’ (FSA, 2007a) (app. 11.2). The intention is to provide information to the public on what constitutes a



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balanced diet with a specific aim to encourage higher quantities of fruit, vegetables and fish (see app.11.3). The guideline covers targets for consumption of dairy and non-dairy proteins (including meat), recommending 15% and 12% respectively of average food intake (FSA, 2007a). It specifies appropriate portion sizes for milk (200ml), yoghurt (150g) and cheese (30g) but does not stipulate quantities of red meat within the overall non dairy protein allowance. The World Cancer Research Fund provides the most authoritative guidelines, with a recommendation of 500g per week (WCRF, 2009): their interest in the topic stems from a link of red meat to bowel cancer and they recommend limiting beef, lamb and pork to 500g per week and avoiding processed meats altogether. On the other hand, both foods provide essential vitamins and minerals: red meats are a good source of protein, iron and zinc, whilst dairy products provide calcium phosphorous and potassium (app. 11.6). The team, wanting to be sure that a reduction in these foods from the diet would not be met with resistance around their nutritional role conducted a high level assessment of other sources of these and found that they are plentiful in other foods available foods with the possible exception of iron, which could be sourced across multiple foods, or taken as supplements. (FSA, 2007). Moreover, the Eat Well plate has not significantly changed since 1994, whilst the team has found evidence of new and scientifically-founded thinking about what constitutes a healthy diet over recent years. For example, “Eat, Drink and Be Healthy”, (Willett, 2001) includes a new food pyramid which reduces red meat to the most sparing of food groups, and dairy from 3 times a day to 1-2 daily. We feel that not only should the government update its guidance to integrate the needs of both health and environment, but that it could potentially also refresh its view on specific foods within the five broad food groups. In summary, this means that health is a “live” and active topic within the government, but also highlights various capabilities which could be replicated to understand what might drive change relating to food and the environment. On the other hand, food policy is dissipated across multiple inter-discipline governmental departments, making coordinated policy setting and implementation very difficult (Scott & Phillips, 2008).

Analysis of the VAT applied to foods in UK (HM Revenue and Customs, 2004) shows that the tax regime was created for a by-gone era where basic foodstuffs are subject to the zero-rate tax, and only some processed and frozen foods are at the standard rate of 15%<sup>2</sup>. Currently, therefore, there is no differential between foods on the basis of how healthy they are (eg. fruit and vegetables are zero rate, as are chocolate chip biscuits), nor environment (eg. all meat including beef, lamb, pork and chicken are zero rate, as are chilled and frozen ready meals, convenience food, all sandwiches, milk and soya/rice

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<sup>2</sup> Standard rate VAT is 15% until January 2010 when it will revert to 17.5%



milks). This provides an opportunity for realignment of this direct-to-consumer tax to incent a diet based on healthy and One Planet Food.

Finally, we analysed studies segmenting consumers according to their environmental bias including one undertaken by Defra (DEFRA, 2008c) and PWC (PWC, 2007). Our findings were that there is a reasonable level of awareness of climate change as an issue but that, so far, consumers have only acted on easily attainable initiatives, such as recycling and moving to energy saving light bulbs. Interestingly, amongst a series of actions tested by Defra for “ability to act” and “willingness to act”, the results for the two food-related actions were polarized. The first was an action to “waste less food”. The second was to “adopt a lower [environmental] impact diet”. Both came out as being something consumers had the ability to act on, and yet reducing waste was the highest single score on willingness, and changing their diet was the action they were least willing to take of 12 in total.

### ***4.3 Implications for Red Meat and Dairy Consumption Reduction***

It is clear that progress to date in relation to climate change and the environment has been slow, but we are of the opinion that the government is now taking some action to move the UK towards a low carbon economy and that in light of this, and a holistic understanding of the relationship between food and the environment, they will be receptive to pragmatic solutions. A conservative party looks set to continue in similar vein should it come to power in the near term. The challenge is rather one of real urgency and clear direction, particularly given that food policy is dissipated across multiple departments. On the other hand, the government has a newly launched campaign which complicates the timing for new public messaging about food and the environment. We suspect that it will therefore be easier to align and build sustainable diet communications (such as portion size and recommendations) into the existing health drive, in the initial instance, and build out to integrated health and environmental messages over time as consumer capacity for absorbing new information about what they eat increases.

## **5. Consumer Profile**

### ***5.1 Methodology***

We conducted extensive consumer and market research of the red meat, dairy and ‘free-from’ markets to define trends and drivers in consumption and to identify potential opportunities and barriers amongst consumers, should there be retailer-led initiatives to reduce meat and dairy consumption. Consumption patterns by social grade, demographics, ethnicity and religion were analysed to establish a consumer profile and to understand penetration levels, frequency and per capita volumes, for both red





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meat and dairy categories. The team also evaluated lifestyle factors, attitudes and values that influence consumption decisions in these categories and explored the influence of special dietary needs on the growth of 'free-from' meat and dairy markets.

### **5.2 Red Meat Consumer Profile**

Red meat is consumed by the majority of people in the UK and consumption has increased in recent years. Both fresh and processed beef and lamb are eaten in a variety of formats, particularly at lunchtime and as a key part of the evening meal. Both are strongly engrained in traditional British eating habits.

People consume more beef than lamb, per capita consumption being 18.3kg per person/yr and 6.3kg/per person/yr respectively (Agriculture & Horticulture Development Board, 2008). Beef is segmented in terms of types of cuts, each being well represented in the market. Lamb is also eaten in a variety of formats. It is the most expensive red meat, which may account for lower levels of consumption (Keynote, 2008 c).

The main factors driving meat consumption are taste, price, provenance and perceived nutritional benefits. Health and food safety are also really important factors. The BSE outbreak in 1990s and more recent E. Coli fears have influenced total consumption patterns, especially for children and older consumers. Consumers are willing to pay for quality in meat and they tend to trust the quality guarantees provided by retailers and independent bodies, rather than government (Corconan et al., 2001).

Demographic differences in consumption patterns indicate that beef and lamb are slightly more likely to be bought by women, people between 35 and 64 years and those within the ABC1 social grades. despite general perceptions that men are more likely to be meat eaters. Veal is an exception, as it is slightly more likely to be eaten by men than by women, as women may continue to hold concerns about aspects such as welfare even though this is no longer necessarily a valid issue. Although penetration levels of beef and lamb are uniformly quite high across all age groups, but there is clustering in purchase among over 35s because of more traditional eating habits and greater disposable income (Mintel, 2004b).

Ready meals containing meat are now established as a main meal, no longer being considered purely as a convenience food (Mintel, 2004a), but other research shows that a surprising number of people still cook red meat in the home as part of the evening meal, especially amongst families with



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young children (Richardson, 2007). Consumers prefer to buy fresh meat to do so, although this is not an affordable option for some groups (AHDB, 2008).

Figure 7 illustrates how red meat forms a primary ingredient of main lunchtime and evening meals for the typical British household. Red meat is associated with enjoyment and is deeply embedded in British culture, illustrated by phrases such as “a big fat steak” and “meat and two veg”. Families tend to cook meat with vegetables in the week, have roast on Sunday and processed meat eaten in composite foods, including ready meals or pizzas as a treat on Saturdays (IGD, 2007a). This indicates that it would be difficult to reduce consumption of red meat by removing these meal occasions and formats from the diet because it would require widespread change in eating habits.

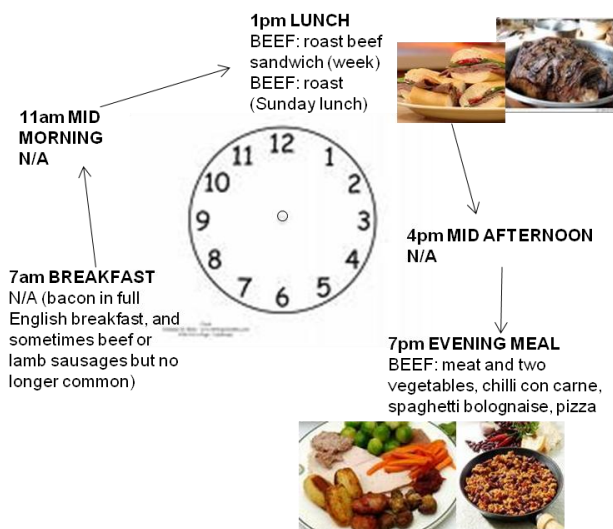


Figure 7: Key Beef and Lamb Moments by Meal Type

On the other hand, we found that in spite of long standing patterns of red meat consumption in the UK, there are a growing number of people who are actively seeking to avoid red meat from their diet although this is not always translated into buying behaviour (IGD, 2007a). Those acting to reduce meat in their diet can be characterised as “meat reducers” (reducing meat from the diet) or “meat avoiders” (seeking to eliminate meat consumption) (Baker et al., 2002). This trend provides an opportunity for reducing consumption by encouraging meat reducers and avoiders to eliminate more beef and lamb from their diet, without the need to drastically change their attitudes.

### 5.3 Dairy Consumer Profile

Dairy products are pervasive, enjoying a high level of penetration, both in volume and frequency terms, and form a core part of eating occasions throughout the everyday life. This implies that dairy



## Strategies for reducing the climate impacts of UK red meat/dairy consumption

products are deeply engrained in everyday habits and cultural behaviours. Milk and cheese account for over two thirds of dairy consumption, which suggests they should be the primary focus in reducing overall volumes. Per capita consumption of milk was 84.6 litres/ppn/year in 2005/6, although this has been falling long term at a rate of 1% per annum. After milk, cheese is consumed in greatest volumes, with people eating on average 6kg/ppn/year. Consumption of yoghurt and butter are lower at 10.5 litres/ppn/year and 2 kg/ppn/year respectively (Keynote, 2008a).

Over 90% of people consume milk and the majority do so daily. The three most popular uses of milk are on cereal, in tea or coffee, or on its own as a cold drink, especially by children. Cereals are eaten most days of the week by 85% of the population and tea and coffee is drunk an average of three times a day by 70% of the population (Defra, 2008b; Keynote, 2007b; Bee, 2009). Milk consumed as ice cream is eaten as a treat, a snack during the summer period or as a desert option, by over 70% of people, on a weekly to monthly basis (Keynote, 2007a).

Around 70% of people eat cheese, most often between 2 and 3 times a week. With 76% of population choosing to eat cheese sandwiches, lunchtime is a key meal time for cheese (Mintel, 2005a). Cheese is also commonly used in a range of traditional British and Italian meal formats (such as macaroni cheese, cottage pie, lasagna) and composite foods including ready meals and pizzas which are eaten every 2 to 3 days by over 60% of the population, primarily in the evenings (Mintel, 2004a; Mintel 2005b; Mintel, 2005d). 73% of people eat yoghurt, typically every 2 to 3 days, but in lower volumes than cheese or milk. Yoghurt is used in cooking, eaten as a desert, or kept in the fridge as a snacking option throughout the week (Mintel, 2005c).

In spite of dairy's overall ubiquity, there are clear differences in consumption patterns by gender and social grade, pointing to a need to develop targeted messaging towards particular groups, based on their needs and behaviours. Women consume proportionately more dairy products than men, especially of yoghurt and ice cream (ONS, 2004; Keynote, 2007a). Unprocessed products such as cheese in blocks and yoghurt, as well as organic, functional and fortified dairy products tend to have an ABC1 bias, whereas processed dairy products such as cheese spreads and slices and margarine have the highest penetration amongst C2DE grades (Keynote, 2008a).

Lack of time and changing family and household dynamics are driving changes in where and how food is consumed. Food choice is increasingly driven by convenience, in addition to the core purchasing drivers of taste, price, quality and availability (EFFP, 2005). The prevalence of recent new product launches in the dairy sector targeted at the snacking and the eating 'on-the-go' markets support this notion (Keynote, 2008b). Health and wellness is also an important driver of dairy consumption



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(Euromonitor International, 2007). Until recently, organic has performed well: the CAGR for organic milk and yoghurt was 47.1% and 106% between 2002 and 2006, compared to 2.3% and 13.3% for their conventional counterparts. (Euromonitor International, 2007). Overall, we see that consumers associate dairy products with good nutrition, healthy eating and wholesomeness (Keynote, 2008a). This is particularly true for milk and yoghurt.

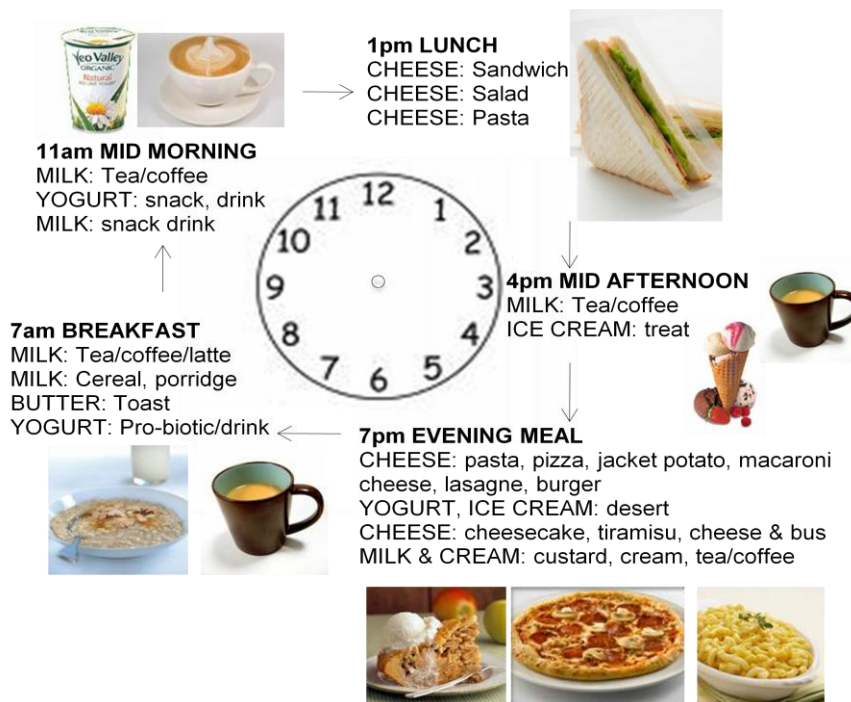


Figure 8: Key daily dairy moments by category

Consumers are used to consuming dairy products daily and in a wide variety of formats, particularly milk and cheese, suggesting that removing or reducing dairy may be challenging. Therefore it is our view that consideration should be given to reduction by diluting the volume of dairy found in existing meal formats throughout the day or by offering direct substitutes, as this would not require a dramatic shift in current eating patterns. Actions targeting elimination would need to reshape perceived links between dairy and health, nutrition and wellbeing.

## 5.4 Ethnic and Religious Groups Profile

Religion and ethnicity have little influence on dairy consumption, but do give rise to distinctive, if limited trends in meat consumption. Certain religions prohibit the consumption of red meat, but these denominations have a relatively small presence in the UK, so they do not heavily influence overall consumption. Diet is an important part of maintaining cultural identity for many ethnic groups, and



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research suggests that this should be taken into account when communicating messages about diet and health to these groups (ONS, 2009).

Only 2% of people hold religious beliefs that prohibit meat consumption, so the impact on overall meat consumption is small. Buddhists (0.3% of population) do not eat meat that has been killed intentionally. Hindus (1% of population) do not eat beef or lamb and Sikhs (0.6% of population) tend to be vegetarian. The majority of the population, however, characterise themselves as Christian or agnostic and therefore are not subject to any prominent rules linked to meat consumption, although many Catholics continue to abstain from eating meat on Fridays, preferring fish instead (ONS, 2001a; NYA, 2009; Hubpages, 2009). The Muslim diet does not allow pork (NYA, 2009), which has implications for this group of people to replace red meat with pork, but Muslims only represent 2.7% of population (ONS, 2001a), and there are several other red meat alternatives (chicken, fish, nuts etc.) so we do not believe that this represents a barrier of any size.

Ethnic minorities make up 8% of the UK population. Most are dominated by one religious denomination, but people of Indian origin comprise both Hindus and Sikhs (ONS, 2001b). The link between religion and ethnicity in part explains the dietary focus of ethnic groups but preservation of cultural, gastronomic heritage is also key to understanding dietary habits of ethnic minorities. Ethnic groups fall into two clusters by dietary focus; Punjabi, Gujarati and Black Caribbean cuisines tend to have a vegetable or fish based diet and include less red meat than Pakistani, Bangladeshi and Black African cuisines: the same government research indicates that diet is an important part of cultural identity for minority groups and suggests that they respond better to direct and rational messages about food compared to the majority of White British people (Department of Health, 2008).

Overall we do not believe that ethnic or religious groups are key to reducing GHG associated with red meat and dairy, nor do they represent any real barrier to change. On the other hand, recipes from the ethnic minorities have permeated mainstream British cuisine (Mintel, 2004), and our team believes they may provide possibilities for making vegetable based meals more appealing to the mainstream population in the future.

### **5.5 Special Health Needs Consumer Profile**

There is a small section of the UK population whose diet is influenced by allergies to specific foods - primarily dairy and wheat. In addition there are a growing number of people who believe they are intolerant and are trying to reduce consumption of these foods. These trends imply that it may be easier to move people away from dairy products, but that will be harder to switch people to some of the



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carbohydrates (eg. bread, or pasta) from dairy or meat because of the notable proportion of wheat avoiders.

An estimated 1% of people are thought to be coeliac (an autoimmune disease, triggered by gluten) but 13% of people believe they are wheat intolerant. Similarly an estimated 5% of the UK population is allergic to lactose but c. 13% of people believe they are dairy intolerant (FSA, 2007b). Symptoms of lactose intolerance can be avoided by not consuming dairy products and a market for lactose-free products including milk, yoghurt, deserts (Euromonitor International, 2008) has developed to replace them. It is currently worth only £23m, but is forecast to grow solidly by 6.5% CAGR 2006 to 2011 (Euromonitor International, 2008). With innovation and better visibility in-store, soy-based dairy substitutes, for example, have shown strong growth, though they still represent a very small proportion of the overall market (Euromonitor International, 2007). We concluded that there are already direct substitutes for some dairy foods, which would enable quicker consumption 'switching'.

Allergies to specific meats also exist, though the proportion of sufferers is not known, and they are thought to be very small. More importantly, significant trends in meat avoidance and abstinence are evident. An estimated 5% of the population define themselves as 'complete' vegetarians and a further 4% are pescarians. In addition, 29% of people characterize themselves as 'meat reducers' (reducing the amount of meat meals they have) and 8% of people identify themselves as 'meat avoiders' (striving to avoid meat altogether) (Keynote, 2007c).

Differing patterns of consumption, from meat reduction to vegetarianism, are strongly related to health concerns (Baker et al., 2002). This was demonstrated during the BSE outbreaks in the UK during the 1990s, when the number of vegetarians peaked in the UK due to concern about the potential adverse health impacts of eating beef. Since then, however, public confidence has recovered and the number of vegetarians has been declining (Keynote, 2007c). There are also links to cancer from eating processed meats (WCRF, 2009), but this is poorly understood by the public (FSA, 2008).

The vegetarian foods market is now worth £718.5m, with year-on-year growth of 8.2% as a growing number of meat reducers and avoiders have opted for meat-free products. Market research suggests that as many as one third of people purchase food products suitable for vegetarians as part of their monthly eating patterns (Keynote, 2007c). This indicates that the vegetarian foods market has appeal to the broader population, and meat avoiders and reducers could be encouraged to switch to vegetarian options more frequently within existing dietary patterns.



## 5.6 Summary – All Consumers

Our analysis of red meat and dairy consumption shows that the vast majority of the people eat beef, lamb and dairy products, associating them with good health and routinely consuming them in a wide variety of meat formats and occasions. Given the time it takes to change consumer behaviours and beliefs (Maxwell, 2009), our analysis suggests it may be easier to find solutions for reducing red meat and dairy consumption within existing formats and occasions, such as reducing portion sizes, or stimulating markets for meat and dairy alternatives. Moreover, our study has identified latent desires to reduce the amounts of meat and dairy in almost one third of the population, which may provide an underlying receptiveness for substituting meat and dairy with alternative products, if retailers can make it easy for consumers to change (i.e. provide choice at comparative prices and raise awareness of new products).

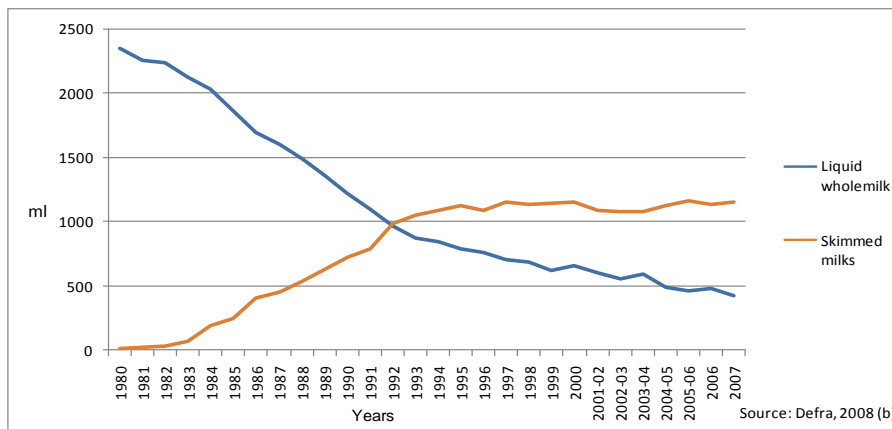


Figure 9: UK household purchased quantities of whole and skimmed milks 1980 to 2007 (average per person/wk in ml) (Defra, 2008b).

A scan of food markets over the last 20 years raised a good case study directly from one of our categories under study and demonstrates how quickly such change can happen; in 1980 the UK market for liquid milk was 100% full fat, and as a result of health campaigns to reduce the amount of fat consumed, began a pattern of long term decline. However, the market for skimmed milks grew to replace the decline in whole milk, as shown in figure 9. By 1990 skimmed milk consumption was greater than full fat and has since accounted for around two thirds of total milk consumed (Defra, 2008b).

## 6. Retailers and Red Meat/Dairy

The WWF One Planet Strategy highlights the importance of retailers as the ‘link between production and consumption’ in the food chain. It cites the reasons for this as follows:





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“Because consumers can only buy existing products in existing locations, the role of retailers and processors goes beyond responding to consumer demand; it includes shaping and creating this demand” (WWF, 2008).

A recent World Business Council for Sustainable Development (WBCSD) report goes on to define the role of business as ‘mainstreaming sustainable consumption’, though innovation, choice influencing and choice editing as well as more sustainable production and supply chains (WBCSD, 2008). Therefore we dedicated a significant portion of our research to this stakeholder group.

### **6.1 Methodology**

The key question we were seeking to ask about the retail sector was “To what extent are the retailers likely to buy into or resist any changes to meat/dairy in customer diet?” and we broke this down into 3 main areas: first, we wanted to understand the role of the red meat and dairy category in the overall retailer portfolio; second, we wanted to identify the retailers’ current environmental and CSR programmes to establish their priorities and whether the link between climate change and food was already understood or being tackled; and finally, we researched the retailer programmes around nutrition to gauge how well they align to a sustainable diet. Our research was undertaken in two phases. An extensive review of the company communications for all the major retailers, including their CSR reports and website information was cross referenced with some sector level reports. We supplemented this with primary research in the form of store visits and telephone interviews with key retailers (app. 11.3). Within the 2 week research phase we were able to speak to 4 retailer representatives from both CSR and food categories to conduct a structured interview, for an average of 40 minutes each (app.11.6). Although a limited data set, we feel this is likely to be representative of retailer views, and it provided the team with some useful additional insight, complementary to our desk based research.

### **6.2 Retailing in the UK**

In the UK, there is a high level of concentration. The top 4 players (Tesco, Asda, Sainsbury and Morrison) control circa 68% of the market (Verdict, 2008). The large multiple grocery retailers have, on the whole, seen impressive growth over the previous decade, with strategies of format diversification, tailoring of propositions to meet different customer needs (e.g. “Tesco’s good better best approach), extension into non-food and overseas expansion. In the same period, IT advances have enabled a transformation of the data used by these retailers, and they now boast state-of-the-art supply chains, with real time, electronic data exchange, sophisticated forecasting and logistics optimization (IGD, 2007b), as well as powerful capabilities to derive insight on customer behaviours from loyalty databases





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and their eCommerce platforms (Jackson, 2009). Like all good businesses, retailers put their customers at the heart of everything they do and “customer choice” is paramount: Tesco’s latest Corporate Responsibility Review states that “We listen to what our customers want and give them choice by providing relevant and personalized information, and ensuring that our products are affordable, rather than by dictating to them what they should buy” (Tesco, 2008); we believe the approach is broadly similar for all supermarkets.

### 6.3 Category Analysis

Both meat and dairy are core parts of the supermarket business contributing to all aspects of their brands: the categories span the provision of staples, value for money offers, impulse purchases and in-store customer service (through deli counters). AC Nielsen Scantrack data from May 2004 for a major supermarket, which showed that meat represented 8% of total sales with beef the strongest product after poultry, and dairy and deli representing another 8% with 4% in milk and cheese. This was confirmed in our recent retailer interviews and comments included:

- “Dairy and especially red meat are “iconic” assortments for [us], and the driver of major footfall.”
- “[Red meat and dairy] are “power categories” – fresh food is part of the destination shop and the biggest driver in the business.”
- “Meat is one of the primary reasons for customers to shop at [our stores] – they come for high quality protein. I’m mainly talking about fresh joints. Dairy is less strategic.”

Many supermarkets use ‘Britishness’ to drive sales and a sense of quality in their meat products: for example, Tesco sources 95% of its beef from UK, 80% of its lamb (Tesco, 2008); Asda sources “nearly all” of its beef and lamb in Britain (Asda, 2009b). Recently, the meat category has also been used for seasonal promotion around summertime BBQs to encourage consumption, for example through National BBQ week (Brand Republic, 2008; UK Retailer C, 2009).

Our interviews also shed additional light on the characteristics and trends in these categories: fresh meat is primarily own label i.e. it is totally within the control of the supermarkets to define quality, cuts, packaging, labelling; mid-term trends are towards value and differentiation through provenance and convenience; and short term trends are towards scratch cooking again, as customers seek to cut back on spending (UK Retailer A, 2009). The credit crunch has also caused people to change patterns of consumption, although within the category. For example, one retailer pointed to customers trading-down from steaks to burgers (UK Retailer C, 2009) whilst another highlighted up-trading (to 11-12 day dry aged beef) which he attributed to “people making the decision to eat in nicely instead of eating out”.



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Given the objective of our investigation this information might suggest that, although red meat is an expensive food item, price alone will not shift people out of the category but rather change what choices they make within it.

Dairy products are split between own label, co-operatives brands and multinational food manufacturers: generally, milk and cheese are own label and more processed products, such as yoghurts and ice-cream are driven by players such as Danone, Unilever and Nestle (Euromonitor International, 2006). In our retailer interviews, major trends of health and indulgence that we identified in our desk research were confirmed, as well as the price sensitivity of commodity dairy (butter, fats, bulk cheddar) where promotions and high brand or product promiscuity lead to sizeable switching (UK Retailer A and D, 2009). The increase of pre- and probiotics and their association with health was also raised (UK Retailer D, 2009).

Of note for our study is the reference made to the role of recipe cards and celebrity chefs in these markets. One retailer noted how “lots of customers wait for them and then cook the recipe. [We have] a large archive of recipes and these are most searched part of website.” In addition, he explained how;

“Celebrity chefs can change behaviour change if they are presenting something relevant to the customer”. When Jamie [Oliver] did his chicken programme we saw a big up-tick which caused a permanent change in buying towards free range chicken and sales have continued at 12-15% higher for the whole year. This is a huge and sustained swing, mostly from volume increase.” (UK Retailer A, 2009).

At the same time, several of the interviewees indicated that they were experiencing a drop in organic and attributed this to both the relative high price in an economic down turn, as well as consumer confusion over what it stands for, as more pesticide-free products become available within standard ranges (UK Retailer A and C, 2009). Interestingly, in response to the question about soy feedstock, one noted that they had conducted a recent survey into customers’ perception of genetically modified (GM) soy feed and found that there was a low level of concern (UK Retailer A, 2009). This seems to indicate an attitude of “laissez faire” about upstream food production which echoes what we found in our consumer research, and points to much less concern about GM than in the past.

Finally, the location of a product in store is a big driver of sales, since each area has a different typical footfall, flow and visibility: adjacencies of products will naturally encourage customers to consider them at the same time, and the quality of the shelf space, merchandising and assortment is a significant driver of sales (Jackson, 2009). Retail outlets are designed to create a good shopping “experience” and after often organized by technology (ambient, chilled or frozen). With this in mind, our



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store visits highlighted some useful insight about red meat and dairy categories in comparison to existing alternatives. Currently in most stores fruit and vegetables appear near the entrance to provide an impression of freshness throughout, followed by large chilled presentations of fresh meat and dairy in high traffic areas. Commodity dairy (i.e. milk) is a “destination” category since everyone buys it, so is placed in easily accessible parts of the store, whilst higher value dairy items such as yoghurts are more of an impulse purchase and merchandised with deserts and often on gondola ends. Cheese is sometimes served at a “shop-in-shop” counter with personal service. On the other hand, with the exception of pork and poultry, possible alternatives to red meat and dairy such as meat alternatives, tofu, soya or rice milk, and all free-from products are often consolidated in small areas near cooking ingredients and other traditional, ambient categories. The result is that fresh beef, lamb and dairy have high visibility, but customers have to “go looking” for alternatives.

### **6.4 CSR and Sustainable Farming**

Our secondary research indicated that all retailers have extensive programmes to address climate change, although few have started to monitor or reduce water, and biodiversity is not on their radar screen. Most are addressing food issues relating to waste and packaging but not yet messaging sustainable consumption. The exception to this is Asda who are encouraging customers to reduce waste and portion size albeit in a low key way. All have some customer waste reduction initiatives but mostly by a loose tie-in with WRAP’s Love Food, Hate Waste programme. Details for each retailer can be found in an interim presentation available upon request but we highlight below some facts which are perhaps most pertinent to our specific issue of red meat and dairy.

Tesco have a carbon footprint pilot on 100 products which could be potentially be extended across the red meat, dairy and adjacent categories to stimulate awareness of relative environmental impact, as well as a £25m investment in the Sustainable Consumption Institute at Manchester University where they are seeking to study “how to motivate customers to play their part in tackling climate change” (Tesco, 2008) and which could be directed towards understanding how consumers might be persuaded to move to a more sustainable diet.

Asda successfully launched a 50% less carbon egg range, branded “respectful eggs” (Farmer’s Weekly Interactive, 2008) and could be extended to red meat and dairy: they are also researching low carbon farming with 100 dairy farms and could become a centre for best practice low carbon dairy farming.



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Figure 10: Asda's new low carbon egg range "Respectful Eggs"

Sainsbury's have a "Dairy Development Group" which, in conjunction with the Carbon Trust, is aiming to reduce the carbon footprint of 320 farms by 10%: this could be accelerated to support technological driven improvements in dairy: they also focus on understanding teenagers and could investigate how this future generation will/might eat in the future (Sainsbury's, 2007).

Waitrose have a "Responsible Agronomy Group", linked to Lancaster University to help fruit and vegetable suppliers make reductions in GHG: this might be able to incorporate research to help understand the footprint of possible alternatives to red meat and dairy (especially vegetables): they are also a conduit to almost half the UK schools with the Farming and the Countryside Education programme (FACE) and could incorporate messages around food and climate change into this programme for school children.

M&S have the most convincing top down climate change goal and, given their market positioning with affluent consumers, could pioneer a "eat better and less" campaign amongst customers.

Interestingly in our telephone interviews with retailers views were polarised about whether we should address the issue of ruminants and GHG specifically: one retailer was adamant that it was wrong to "demonise" a single category, pointing to Kenyan beans and horses kept for leisure purposes as examples of why it was unreasonable (UK Retailer C); another was more accepting of the need to improve the supply chain, but less confident that customers would make the leap. "[I am] not optimistic about a wholesale change in behaviour driven by retailer practices only "(UK Retailer A). Others pointed to the difficulty in communicating complex messages to customers: "I am not convinced that carbon label will be helpful to customers yet ... [we] have to think creatively about it. No doubt, though, there is room to do better in communicating." Finally, there was a desire for clarity about the topic, with both a desire to be told "what a low carbon diet looks like" (UK Retailer C, 2009) and a well-defined boundary scope in LCAs (UK Retailer A, 2009): "The government needs to button down what is meant by carbon footprint. It is currently too convenient for those who want to measure their carbon to set own criteria for what needs to be included", he told us. These sentiments seem to echo the feedback in the Sustainable Development Commission (SDC) report "Green, healthy, and fair" that "Retailers perceive



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the absence of an overarching sustainable food strategy, or vision, from government to be the key barrier to their efforts to improve sustainability” (SDC, 2008).

### **6.5 Nutrition**

All retailers provide customers with nutritional advice, mostly based on FSA guidance. A review of their customer websites and information from our retailer interviews illustrates that all are giving high profile to a balanced diet and encouraging more 5-A-Day fruit and vegetables, and more fish. Less visible and deeper within the nutritional information on their websites is a recommendation of 3 portions of dairy a day and modest meat consumption but there is no information on pack to advise how many portions are in a given product. Retailers also provide additional diet information tailored to their customer segments/positioning in the marketplace. This includes recipe suggestions and special diets, such as diets for people with diabetes, or intolerances, women in pregnancy or who are vegetarian. However, in the recipe and advice pages we read, meat and dairy products were well represented and we believe that more could be done to encourage a higher proportion of vegetables and vegetable based meals, and to make alternatives to dairy or meat products much more visible within retailer communications. Behind the scenes, the primary focus is on three initiative areas: reduced salt and saturated fat, the removal of additives and artificial colours and sweeteners, and clearer nutritional labelling. It is worth noting that there is no consensus on nutritional labelling and that over the past few years there has been a divergence between Guideline Daily Allowances (GDAs), (which Tesco has introduced) and multiple nutritional labelling schemes (such as that adopted by Sainsbury’s).

### **6.6 Implications for Red Meat and Dairy Consumption Reduction**

Analysis of the role of red meat, and dairy in retailers’ total portfolio shows that it holds a central place and the retailers are likely to have a strong preference for addressing environmental concerns relating to ruminant animals behind the scenes, rather than reducing sales amongst their customer base.

Whilst retailers have, on the whole, active and extensive climate change and environmental programmes underway, and are aware of the issue around GHG from cattle, they are not yet truly addressing the issue of carbon in the food chain, although they express a willingness and desire to do so if a level playing field were established by the government. On nutrition, all retailers seek to offer healthy choices to customers, and by and large take their guidance from the FSA Eat Well plate such that their focus is on elimination of salt, saturated fat and additives, as well as increasing fruit and vegetable intake. There is no emphasis on appropriate quantities of meat or dairy for the average Briton, although



we heard expressed a willingness to promote a “sustainable diet” if an agreed definition of one were made available.

Overall, it is our view that leading retailers will be willing to adopt new farming and operational practices throughout the food chain for red meat and dairy which reduce environmental impact and costs provided there is agreement that the whole sector needs to do so, and provided the timeframe is reasonable. Changes to the customer offer will be met with more resistance unless it is seen to meet customer needs and there is an associated revenue stream: communications about diet and portions are probably a negotiable compromise, since they support the idea of informed customer choice. Future issues in reducing meat and dairy will be: a) defining a low carbon or “sustainable” diet as guideline for retailers to work from b) integrating health/nutrition and environment issues relating to food and c) moving away from growth: tackling over-consumption head-on.

### 7. Options and Impact Assessment

Our options analysis indicates that it is easily possible to achieve the 25% reduction in GHG by 2020 and 70% reduction by 2050 (versus a 1990 baseline) with a combination of value chain and consumption related changes. Indeed, the 2020 25% target reduction is achievable through supply chain improvements alone and does not require changes in consumption. By 2050, however, consumption changes must fill a 5.7MT CO<sub>2</sub>e ‘gap’ once the improvements to the value chain have been implemented. We concur with research carried out by the Genesis Faraday Partnership that in the mid-term this will require a systematic focus in all livestock and dairy farms to adopt best practice in herd selection (Defra, 2008), as well as significant operational efficiencies in processing and retailing. Achieving the longer term goals will require three major efforts: first, an extensive change in farming at a more fundamental level, with the acceleration of techniques which reduce nitrous oxide emissions, harness and utilize methane emissions, and drive maximum energy efficiency; second, a government and retailer driven campaign to generate consumer awareness of red meat and dairy portions and aiming to reduce consumption to the recommended daily or weekly amounts required for nutritional needs; third, it will require retailers to step up their environmental programmes and decarbonise their operations. The priority must be on farming practices which far outweigh any other aspect: in 2008 farming and fertilizers represent 68% of red meat and dairy GHG emissions, and in 2050 they could drive 60% of the value chain related reductions. And, although the 2020 goal does not strictly speaking require changes in consumption, the lead-time in generating change in public behaviour is such that action is required immediately to build momentum for the shift.



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By 2050, consumers must transfer a significant part of their red meat and dairy consumption into direct substitutes, and retailers should stimulate innovation and markets for these. This is not to say that action is not required in other elements of the value chain, such as consumer waste, but in the overall scale of the challenge, we cannot achieve the objective without transformation of agricultural practices and new consumptive patterns.

We recognize that none of this is easy, but consider that our proposed actions are all pragmatic and do-able if government, the agricultural sector and business have the collective will, and provided there is investment from the government to provide specific shared infrastructure platforms, notably a decarbonised energy sector, and extension of the gas grid to allow bio-methane equivalence to farmers, as currently proposed by the Conservative Party (Conservative Party, 2009). We cover the details of what is required in the following chapter, but here outline our methodology.

### **7.1 Methodology**

Our approach to options and evaluation included a structured process to: a) determine the 1990 baseline and define the business as usual (BAU) scenario projections; b) quantify the scale of the challenge to reduce emissions; c) outline a set of mutually exclusive and collectively exhaustive options and evaluate the impact of each; and d) to aggregate the estimated impact to allow a variance analysis versus the goal.

To estimate potential emissions reductions we made a distinction between the existing supply chain (including waste) and consumption change (ie volumes consumed), treating each in turn. (We refer to the combined parts as the “total value chain”). For the former, we analysed current and projected emissions for each part of the supply chain. For consumption, we conducted both a top-down analysis to establish whether it was possible to reduce consumption without contravening nutritional guidelines, and a series of bottom up levers to change consumption of specific types of food with tangible interventions.

### **7.2 Target Reductions 2020, 2050**

WWF’s One Planet Food Strategy sets a goal of 25% less GHG resulting from the production and consumption of food destined for the UK, based on 1990 levels. This increases to -70% by 2050 against the same base year. Since the focus of our analysis was red meat and dairy, we sought to establish the volume tonnage of these categories and GHG emissions associated with them for 1990, 2008 and projections for 2020 and 2050.



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First, we determined the GWP in CO<sub>2</sub>e for beef, lamb, and dairy products in 2008. For an upcoming report for Defra, Williams et al calculate the GWP of pre-farm gate beef and lamb to be 13 tonnes CO<sub>2</sub>e per tonne of edible carcass, whilst milk is lower at 1 tonne CO<sub>2</sub>e per 1,000 litres (approx. 1 tonne liquid milk) (Defra, expected late 2009). However, since this does not consider the post-farm gate emissions, we have used a conversion factor to up-weight each of these to a GWP for the whole supply chain. A report by ERM on the life cycle analysis (LCA) of red meat indicates that the pre-farm elements of red meat represent 68% of the total life cycle emissions generated (Aumonier, 2008) and we have used this for all other food categories under consideration<sup>3</sup>.

Using the growth rate of red meat and dairy consumption from 1990 to 2007, we calculated CAGRs of 0.65%, -0.66% and -0.54% respectively for beef, lamb and dairy. We were then able to forecast consumption of red meat and dairy in years 2008, 2020, and 2050 by extrapolating the CAGR trends forwards accordingly.

Research into the GHG associated with livestock farming highlights that there have already been improvements (Defra, 2008) based primarily on herd selection. For dairy this is sizeable: we have witnessed a total drop from 1990 to 2008 of 14%; for beef and lamb, however, it has barely moved at only 0.23% and 0.61% respectively.

We used these values to extrapolate a 'best guess' GWP for beef, lamb and dairy produce in 1990. Combining this data with the 1990 consumption volumes of each category, we calculated the total GHG associated with red meat and dairy to have been 52 MTCO<sub>2</sub>e in the base year. Therefore, WWF targets provide for GHG emissions levels of 39 MTCO<sub>2</sub>e and 15.5 MTCO<sub>2</sub>e for 2020 and 2050 respectively - a drop of 13 MTCO<sub>2</sub>e (25%) and 36.5 MTCO<sub>2</sub>e (70%) from 1990.

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<sup>3</sup> Further research yielded significantly different indications of the relative GHG intensity of the life cycle stages, for example that milk accounts for 90% of the total life cycle emissions of dairy produce (jw22 MBS, 2006). We therefore felt that our assumption was a conservative one.

<sup>3</sup> The unexpected dip in GHG occurs is explained by the fact that we assumed past reductions in GHG would continue out to 2020 and then remain static from 2020 to 2050 and therefore growth in consumption is no longer offset by reductions in the GWP for each commodity.



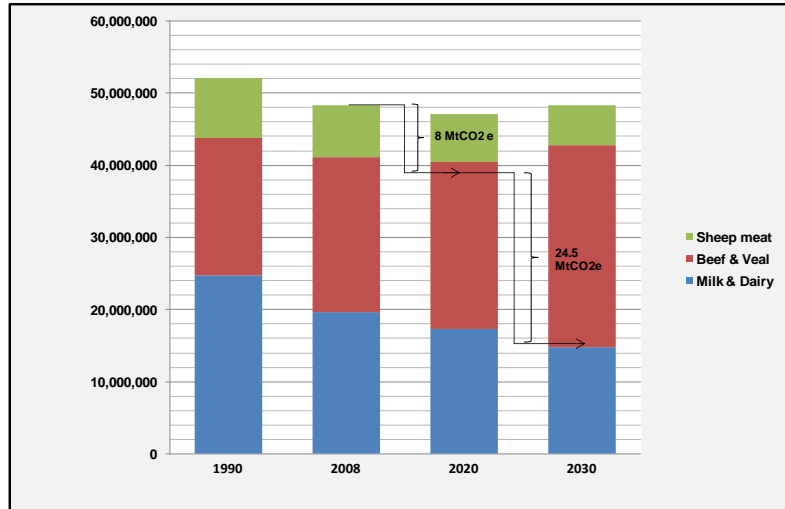


Figure 11: GHG baseline, business as usual scenarios and WWF reduction targets (MTCO<sub>2e</sub>)

Figure 11 shows these key estimates in graphical form, and highlights how the business-as-usual case would see a reduction in total red meat and dairy GHG to 47 MTCO<sub>2e</sub> in 2020, followed by an estimated increase to 48 MTCO<sub>2e</sub> in 2050. In reality therefore, WWF's goals would require an absolute drop of 8 MTCO<sub>2e</sub> (17%) and 32.5 MTCO<sub>2e</sub> (68%) in 2020 and 2050 respectively, based on 2008 emission levels of 48 MTCO<sub>2e</sub>. In fact we note evidence of further improvements, relating to significant tightening of fertiliser used on dairy farms (Defra, 2008), which would make the 1990 base GHG even higher, but which we could not model in the time available to us. None-the-less it points towards our 1990 estimate being at the low end of the likely range, and implies that the target reductions we define are perhaps conservative.

### 7.3 Options and Evaluation – Supply Chain

To establish what contribution changes to farming and business practices might make to our target GHG reduction, we reviewed a wide range of available material on the lifecycle of red meat and dairy including studies from the FCRN (Garnett, 2007 & 2008), DEFRA (Defra, 2007), Dairy Supply Chain Forum (DSCF, 2008), Green Alliance (Scott & Phillips, 2008), and the Genesis Faraday Partnership (Defra, 2008) as well as reports on the Climate Change Agreements (CCAs) with food processors (DEFRA, 2001), and retailer reports as cited in section 6.

Given that we estimate 68% of the supply chain emissions emanate from agriculture, our research focused on that stage. For dairy farming, we concluded that a 30% reduction in GHG versus 2008 should be possible by 2020, and a 50% reduction by 2050, based on the potential for efficiencies in fertiliser production and greater longevity (Defra, 2008). In addition to feed production efficiency, feed-



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additive products are also emerging that can reduce the enteric methane produced by ruminants by 15% (FT, 2009). These estimates were backed up by one of the retailers interviewed who felt comfortable that 40% of dairy GHG emissions could be removed simply with improved herd management, and that this was before adopting more efficient pasture fertilising techniques. For red meat, we concluded that a 20% and 30% reduction in GHG would be possible, for the same reasons combined with an acceleration in the rate of selective breeding best-practice as proposed by the Genesis Faraday Partnership (Defra, 2008). We therefore approximated that a 25% and 50% reduction could be achieved in combined red meat and dairy by 2020 and 2050.

For food processors and manufacturers, where the primary source of GHG is from energy, and for whom CCAs have been in place since 2001 (DEFRA 2001a, 2001b), we assume GHG reductions of 4% and 6% (assumed 5% combined) are possible by 2020 if they maintain the energy reduction goals as specified under current legislation. By 2050 we assume that processors will have reduced their energy emissions by 80% in line with the overall targets specified by the Climate Change Act. The next phase of legislation to meet this target is the Carbon Reduction Commitment (CRC) that commences in 2010, includes large retailers and is catalysing action. Transport related energy use is not included in the provisional CRC scheme, but our analysis in chapter 6 illustrated how many retailers have already been able to drive fuel efficiencies across their fleets (Asda, 2009), and we assume that by 2020 they can achieve a 50% reduction. Some retailers are already moving to electric fleets, such that a decarbonisation of the energy sector by 2050 should allow retailer related logistics to reach carbon neutrality.

For packaging we concluded that, with aggressive programmes already underway to reduce, reuse and recycle packaging amongst supermarket groups (Asda, 2008, M&S, 2008), they could reduce a large proportion of the packaging-related GHG. There will always be a need for some energy to recycle this, and in 2020 it is likely to still be fossil fuel based, so we assumed only a 50% reduction in GHG; by 2050 we assume a decarbonised energy sector will reduce the GHG from packaging by 70%.

For home-related emissions, we assumed a 10% reduction could be achieved through consumer energy efficiency measures, increasing to 66% in 2050 by which time high-efficiency domestic appliances (e.g. fridges and cookers) would have significant market penetration and/or a significant proportion of shoppers would drive in decarbonised electric cars.

Post consumer avoidable waste of red meat and dairy is only 6.8% and 3.5% respectively of that purchased (WRAP, 2008). We assume that consumer awareness campaigns will remove 25% of this by 2020, and that by 2050 new technologies around smart packaging to advise consumers about consume-



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by dates (Packaging Materials and Technologies, 2009) and better local authority composting facilities will enable a 50% reduction. Lastly, and as we have not conducted any research outside of the retail value chain, we assumed that there would be no change in the emissions derived from catering.

As a whole, our analysis illustrates that it will be possible to achieve 11.4MT CO<sub>2</sub>e GHG reduction by 2020 (v target of 8MT) and 27MT by 2050 (v 32.5MT) across the non-consumptive elements of the value chain, with agriculture being the single most important factor (app. 11.16).

### **7.4 Options and Evaluation – Consumption**

Our analysis of the potential to reduce consumer volumes consisted of both a top down, theoretical analysis of potential reduction if quantities per capita were aligned to the proportions in the government Eat Well plate, and a bottom up analysis of what reductions might be possible based on tangible behavioural changes relating to specific red meat or dairy products. Both indicate a significant potential GHG drop against target reductions of 8MT GHG CO<sub>2</sub>e in 2020 and 32.7MT CO<sub>2</sub>e in 2050. The Eat Well plate alignment would deliver 17.9MT in 2020 (way in excess of target), and 18.8MT in 2050 (i.e. 57% of target). Naturally, the bottom up impacts were more limited since they target narrowly defined groups of consumers and products but, even here, the total impact (even allowing for GHG from substitution) was 3.2MT (40% of target) in 2020 and 10.3MT (31% of target) in 2050.

The Eat Well plate suggests that UK citizens should eat 15% of their food in the form of dairy, and 12% from non dairy foods, including fish, white and red meat, nuts or other protein forms (FSA, 2007). Using the National Diet and Nutrition Survey (NDNS), (ONS, 2004) we were able to analyse the weekly consumption of all foods (8,064g), as well as meat and dairy grammes (app 11.5). This alone indicated that people are eating 61% more non-dairy-protein, and 44% more dairy than recommended (app. 11.6).

However, we went on to define a notional and logical ceiling in grammes of red meat, using the Eat Well non-dairy-protein proportions and applying them to the total grammes of weekly food in the NDNS, but subtracting 280g to account for an FSA guideline to eat two 140g portions of oily fish a week as part of this (FSA, 2007). This illustrated that the ideal red meat consumption per capita should, at most, be 74% lower than it currently is. Thus, we reduced current total market volumes accordingly to determine that the ideal level of consumption would be 664,000 tonnes and 748,000 tonnes lower in 2020 and 2050 respectively. This translates into a GHG drop of 12.6MT and 14.2MT of CO<sub>2</sub>e (app. 11.6).

For dairy we determined that the ideal grammes of dairy should be c. 1,210g, rather than 1,743g as recorded in the NDNS and suggesting that 3.8m and 3.2m tonnes of dairy produce could be removed



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from the UK diet by 2020 and 2050 without contravening the FSA healthy diet. This translates into a GHG drop of 5.3MT and 4.5M of CO<sub>2</sub>e in 2020 and 2050 respectively (app. 11.6).

Our bottom-up analysis of ways to reduce consumption is based on a hypothetical ‘lever tree’ (figure 12). This outlines the four different ways in which volumes can be driven down: first, we might allow the same level of consumption but reduce the associated production, for example by encouraging use of edible offal by humans; second, it is possible to reduce the overall purchase quantity by “diluting” it with other food ingredients, for example with less meat and more vegetables in a meat-based ready meal or less cheese on a pizza or in a lasagna; the resizing of products is another method, reducing single serves such as stick and cone ice-creams in line with recommended dairy portion sizes and counterbalancing the recent super-sizing trend witnessed in so many foods (The Independent, 2005); finally, it is possible to eliminate consumption either by allowing consumers to continue with current food formats and occasions but encouraging them to reduce the frequency of those meals (we see this happening naturally with “meat reducer” consumers), to encourage direct substitutes such as quorn in lieu of red meat, or soya/quinoa/rice milk, or by encouraging a total avoidance of meat (i.e. vegetarianism, or non-dairy diets).

We brainstormed the interventions that would be required by retailers to support each of these (app. 11.7), and then built models to allow bottom up estimates of potential volume and GWP impact (app. 11.8-11.11).

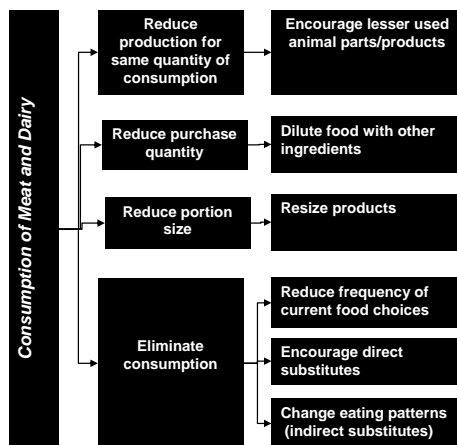


Figure 12: Hypothetical Lever Tree

The detailed assumptions behind our calculations for each lever are detailed in appendix 11.13 and 11.14. but the results of our analysis are that a total of 3.2MT of CO<sub>2</sub>e could be reduced by 2020 and 10.3MT by 2050. That said, some of the levers barely move the dial. Given the high GWP of red meat, all the meat levers perform well, although it is clear that moderate reductions across large tracts of the population make a much more conclusive impact than total elimination of the food category by



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niche groups. Within dairy, the only lever with any magnitude is switching to non-dairy milk alternatives. We believe that enforced portion reduction will be met with consumer resistance, and have little effect, but that widespread portion education and labelling would – in the context of more explicit and stronger FSA portion guidelines – build an awareness that could leverage the sizeable and latent consumer desire to reduce intake of both meat and dairy.

In the UK, it is not typical to tell people how to live their lives, what to eat or what choices to make. Freedom of choice is a powerful underlying principle of our free market economy (Economy Watch, 2007). In recent years, however, there have been more stringent actions to drive behavioural change where there is a strong reason to do so: anti-smoking laws (NHS, 2009), and post watershed children’s junk food advertising (ASA, 2008) are two examples, and in relation to health, insurers are now offering differential pricing to people who look after their health (OnlyFinance.com, 2009). None-the-less, changing consumption patterns usually requires more “carrot” than “stick” and certainly retailers give customers primacy (UK retailer, 2009c). Manufacturers will, clearly, welcome initiatives which increase their markets, and resist those that are likely to depress sales. Government will support moves that address the burdensome health issues in UK without significant backlash from strong sectors of the economy.

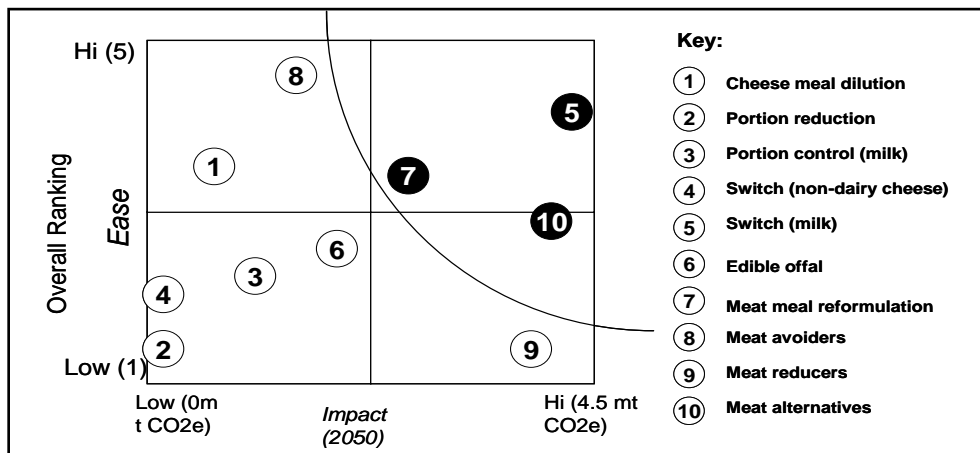


Figure 13: Consumption Lever Prioritisation Matrix

Therefore we analysed the likely response of consumers, retailers, manufacturers and government to each of the levers to assess their “ease of implementation”. The final result, mapping both impact in terms of reduced GHG and ease of implementation, is illustrated in figure 13: it highlights the overall importance of meat and dairy direct substitutes, as well as meat ready-meal reformulation (57% of total consumption lever reduction). These three levers could reduce GHG by 1.8MT and 6.2MT CO<sub>2</sub>e respectively by 2020 and 2050.



## 7.5 Overall Impact Assessment

Combining our analysis of supply chain and consumptive reduction possibilities, we conclude that it should be possible to reduce overall GHG by 13.2MT CO<sub>2</sub>e by 2020 and 33.2MT by 2050, against the WWF targets of 8MT and 32.5 respectively. The lion's share of this is in agricultural reform although all players have a part to play including consumers and tackling meat consumption is a primary imperative. In our calculations, we allow for a "displacement" related to the fact that consumers will likely eat more of something else in lieu of the red meat or dairy they are giving up: in the absence of better data, we have assumed that gramme for gramme consumers replace the red meat with a mix of pork and poultry and dairy with a vegetable-based milk at 30% lower GWP. This is reflected in figures 14 and 15 which show the net results, and resulting 'overshoot'. Whilst it may not be possible, or desirable to action all of the levers, we feel the combined effect of the top three is a positive message of the art of the possible.

We believe that supply chain improvements will be easier to effect than behavioural change amongst large groups of the public. Partly, this is because food market players have an economic incentive to refine their processes: indeed many have started down that path. Partly it is due to the fact that the stakeholders in the food supply chain are – in comparison to a population of 61m individuals - relatively concentrated, and government has greater capacity to influence them.

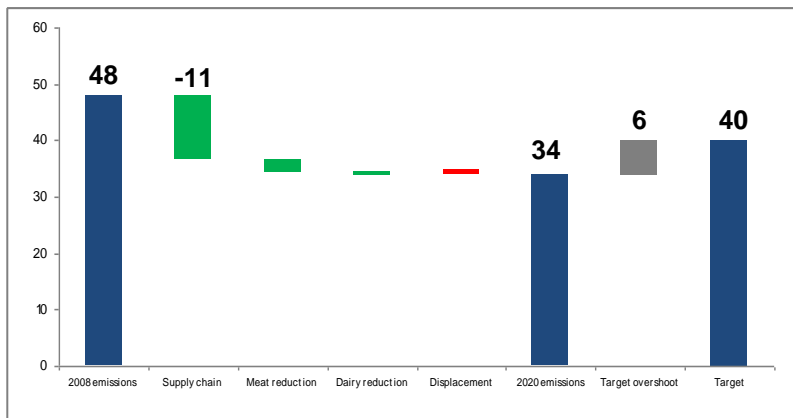
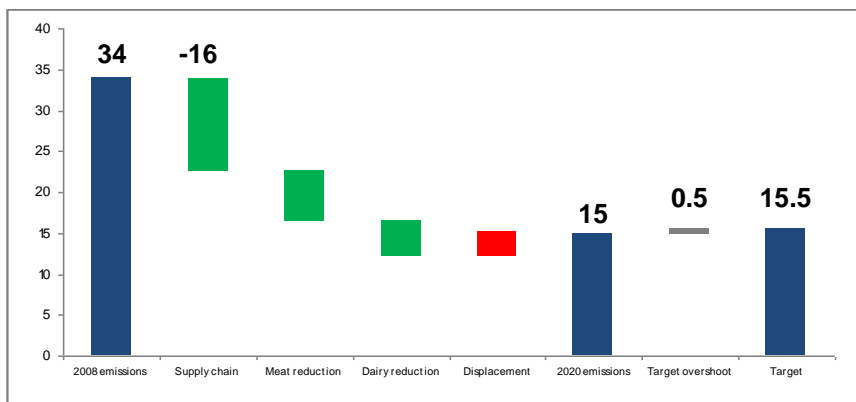


Figure: 14: GHG (MTCO<sub>2</sub>e) Reduction "Waterfall" (Variance Analysis) 2008-20





*Figure 15: GHG (MT CO<sub>2</sub>e) Reduction “Waterfall” (Variance Analysis) 2008-50*

Of course, the suggested changes, both in farming practices and consumptive patterns, will impact British farmers and a drop in volumes may mean that some can no longer stay in business. At one level, we perceive this to be a natural step in the transformation of our economy towards the sustainable basis required to mitigate climate change: on another, we appreciate that this impacts individual lives across a section of society which already struggles to make a living. We therefore did a high-level estimate of the impact on overall tonnage for both red meat and dairy, assuming that all of the bottom up consumption levers were used, and to assess the likely impact on livestock and dairy farmers. The result was that by 2020 beef and lamb farming would have contracted by only 10% versus 2008 but this rises to a considerable 27% by 2050. For dairy, the picture was similar in 2020, with a projected 13% drop in volumes, but by 2050 these farms would be significantly impacted, at -62% (app. 11.18). These numbers are a worst case scenario, since all of the required GHG emission reduction can come from technological advances to 2020. But, there is a shortfall in 2050 which points towards needing about half of the gross reduction resulting from our lever analysis (i.e. we might reasonably envisage that livestock and dairy farming might see volume drops of circa 13% and 32% respectively over the coming four decades). We hope that this serves to catalyse action on their internal improvement opportunities, if nothing else. However, the team believes that it is a necessary reality to consider how some level of contraction might be managed and farmers supported to move to other food stuffs or environmental services, and link this to climate change adaptation requirements.

### **7.6 Implications for WWF One Planet Food Strategy**

We were surprised by the results of our analysis, and triple checked our logic in light of this. But as we dug deeper into the meaning of the study, we tend towards a view of the findings as a positive message. In fact, the baseline of 1990 and the efficiency and productivity gains already delivered by the dairy community make the task ahead easier. Our analysis highlights that there are ample opportunities for reducing GWP through better farming and food chain operational techniques/practices, especially in the midterm. A concerted effort around low carbon farming and retailing by 2020 would afford us the time to understand how to transition the farming sector to a long term and sustainable model for 2050 onwards. At the consumer level, the combination of our policy, health, consumer and market research



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points towards a need to drive a fundamental change in eating patterns: dietary analysis tells us the UK over-consumes both red meat and dairy and there is clear evidence that it would be possible to significantly reduce consumption without nutritional detriment. Moreover, we can see indications that consumers sense a need for healthier eating (as witnessed by the growing number of meat reducers and dairy avoiders), and the environmental burden association with these categories adds weight to the argument in favour of more explicit messaging on appropriate amounts to eat. We believe that an agenda around ‘conscientious consumption’ should also be established as quickly as possible due to the long time required to shift the deeply engrained attitudes and behaviours that surround red meat and dairy products. We were pleased to arrive at what seems a logical and actionable direction.

On the other hand, the WWF One Planet Food Strategy had broad reaching objectives including relieving of water stressed areas, and the preservation and restoration of biodiversity in hotspot areas around the world and these must also be considered. Currently, we do not believe that our recommendations will exacerbate the situation with regards water, or biodiversity. For the technological improvements in the supply chain, we foresee no additional requirement that will demand, for example, more animal feed from endangered rain forest, since the main mid-term solution is careful herd selection along the lines of existing best practice. Operational efficiencies in other components of the food chain are envisaged through better fertilizer /other management practices and low carbon energy supplied according to the UK government’s plans for decarbonising the energy sector. As for consumption, our choice of theoretical substitution was pork or poultry in the case of red meat (which should not impact water stressed areas nor global biodiversity hotspots), and non dairy milks to replace cow’s milk. One of the main substitutes is soya milk, and we recognize that there are unanswered questions surrounding its environmental impacts: in particular, a recent report from Friends of the Earth (FoE, 2008) highlights how the expansion of soy production has led to conversion of forests and grasslands to cropland, “devastating vast areas of wildlife habitat”, releasing huge quantities of carbon dioxide into the atmosphere and affecting the water cycle and soil erosion. In some ways we might argue that the direct substitutes do not need to be soy based, or that the use of soya will not increase per se, but rather switch from feeding cattle to feeding humans with no net increased environmental degradation. In practice, the issue will be more complex and further work to understand the implications of a large soya or other vegetable-based milks market on the full set of environmental considerations is advised as soon as possible.

Finally, we know that products are inter-related and many are by-products of others, such that our analysis simplistically assumes a volume reduction in milk would be possible within the dairy “mix





and that reductions of milk and beef can be made without ramifications one upon the other, and this should be further evaluated.

## 8. Recommendations for Retailer Changes

### 8.1 Methodology

To arrive at our recommendations for the retail sector, we reviewed all the levers in our impact assessment (including options within the supply chain, nutritional guideline enforcement and product related levers) and determined those making enough of a difference and that are capable of implementation within the timeframe to be worth the effort to implement them. We also considered commonality across these and clustered them into groups which would be actionable in concert. This allowed us to synthesise our findings to date into a set of strategic and “umbrella” initiatives, as outlined below.

### 8.2 Recommended Retailer Imperatives and Rationale

If the UK is to achieve reduction in red meat and dairy consumption, we believe that retailers have a key role to play. We consider that WWF should ask them to make commitments to the following five imperatives:

#### 1. *Driving a transformation to low carbon, sustainable farming through their supply chains*

Retailers are uniquely placed to drive transformation through their supply chain to reduce GHG emissions and increase sustainability. Key actions would be to:

- Prioritise and accelerate ecological foot-printing for these categories;
- Set standards for farm and processing suppliers;
- Share best practice with industry standards to allow impact at scale.

Some players have a long standing commitment to high farming standards, and several are investigating carbon footprints and testing low carbon products so this will not be a surprise, but they are likely to want to proceed at their own pace and point to unclear government direction as an “unfair playing field” for early adopters. On the other hand, these are “back of house” changes which will not be visible to customers (unless there proves to be mileage in low carbon meat and dairy products) so they will not perceive it as adversely impacting revenues. Overall they will probably be cautiously receptive.

#### 2. *Creating portion awareness and labelling for red meat, dairy and their direct substitutes*



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We believe that the retailers could help to engender a better understanding of portion size, and daily/weekly recommended consumption through the use of formulation and labelling. This would require:

- Reformulation of composite dishes/meals to align the quantity of cheese or meat ingredients with portion guidelines from the FSA;
- The introduction of front of pack labelling on all dairy (e.g. 1 of 3 a day max) and meat products (e.g. 1 of 3 a week max).

This 'ask' is much more likely to be problematic. Reformulation of the products is a regular initiative for retailers either looking to enhance flavour, remove food 'nasties' or cut costs to allow attractive prices to customers, so the process is familiar. In addition, with the economic downturn, retailers are avidly trying to support customers with keen prices, so there may be some interest in minimising the amount of high cost ingredients such as meat or cheese, provided that it does not impinge on customer preferences and hence lose sales. This is where they need to show leadership, and go beyond incremental reformulation to something more significant, and to communicate why they have done this to customers as a way of demonstrating how they are helping them to achieve a healthy diet. Portion labelling may also meet resistance but the context is slightly different. On the face of it, portion labelling has precedent in the 5-A-Day campaign, set by government and enthusiastically applied by retailers and manufacturers alike, since the basic message is "consume more". In this case, we would be labelling to build awareness in customers of their over-consumption. At a theoretical level we could argue that this is totally in line with the retailer philosophy of allowing customers choice, and at another, that the intended drop in sales will be unwelcome, unless it is considered viable that this lost volume can be switched into alternatives with higher premiums, which may well be the case (see below).

### *3. Creating viable alternatives at scale through innovation in new proteins and milk substitute products*

We believe that the fastest way to create a market for less environmentally onerous foods to replace red meat and dairy will be to ask the retailers to incent and support non-dairy and meat-free products. Specifically they should:

- Identify and appoint suppliers for these categories;
- Dedicate space to and promote dairy free and meat free ranges in store.

This request is, in large part, pushing at an open door, since there are already growing markets in milk alternatives, and meat-free products. The retailers may not be aware of the scale of people who believe they are dairy intolerant or wanting to reduce their meat intake and a campaign to bring this to their attention would highlight the potential in these new revenue opportunities. On the other hand, it



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will not be enough for the retailers to treat these categories as they have to date: for serious uptake by customers we believe these products need to be more centre stage, ranged in proximity to their counterparts in the chiller cabinets, rather than in a less well frequented specialist section of the store, for example. And, the retailers should work to encourage trial of these with high visibility promotions. Such directive suggestions for how they might achieve the goal are likely to be met with resistance, but do signal the degree of commitment WWF is expecting from them. Moreover, the case study of the ten year UK switch from full fat to skimmed milk shows how even where consumers must make adjustments to their taste and visual food references, markets can be superseded in a relatively short period of time. Similarly, the dramatic reduction in egg consumption in the US between 1950-1970, illustrates wide spread reductions in certain food types can be achieved through health campaigns (Willett, 2001).

#### 4. *Driving an uptake in vegetable based meals, through recipes, range and promotion*

Fresh produce is a key part of the retailer offer, as witnessed by its prime position as customers enter stores. We believe that the retailers could make a more concerted effort to show customers how vegetable based meals and dishes can be tasty choices. Our research indicated that retailers have a strong influence on how customers cook and in helping them experiment with new recipes and we would like to see this focused on vegetable based options. In particular we would recommend that retailers:

- Increase their focus on 5-A-Day;
- Create and promote recipes based on vegetables and show customers that a meal is not 'naked' without dairy or meat protein;
- Increase the range of vegetable based meals in pre-prepared foods.

We consider that this is a relatively easy action for retailers to both sign up to and to implement. It does not impinge on customer choice, enforces the "healthy living" message many of them adhere to, and encourages higher levels of sales. The key metric will be in the balance of communication, recipes, or meals with/without meat/dairy and a leadership position would include a commitment to mid-term "proportion" goals for each of these (e.g. 50/50 by 2020).

#### 5. *Raising the bar on operational sustainability to set higher, faster targets*

All major retailers are making inroads to energy efficiency, waste reduction and packaging reduction. But there is huge variability in the level of commitment, and in the timeframes and KPIs they use to set targets and track performance (app. 11.18) These both make it hard to compare and understand what the real impact is, and at the very least suggests that some of them could do more. It is our belief that most of the retailers should challenge themselves on GHG, water, waste reduction and biodiversity



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protection and set higher targets on a faster timeframe, ideally standardised across the industry. The imminent CRC will put carbon emissions more firmly in the spotlight, but WWF could ask them to step up ahead of regulation to safeguard reputation and avoid regulation.

We considered the additional issue of geographic sourcing but rejected it from our prioritised list. The issue of import-export and trade balance is beyond the scope of this investigation, but we are aware that Britain does import both red meat and dairy produce. One potential course of action would be to move to 100% British sourced produce. This might attenuate the impact of reduced volumes on UK farmers, acting as a 'quid pro quo' and making customer portion education more acceptable to them. It could also have some merit in relation to "food miles" or environmental degradation in countries overseas where, for example, in Brazil, rainforest is being destroyed to make way for cattle ranches (FoE, 2008). Ultimately, we felt that this would distract the retailer from the core purpose of reducing consumption and that issues relating to land change in Latin America should be handled through the Round Table for Responsible Soy (RTRS, 2004) and more stringent certification for soy per se, which would also have the effect of preventing environmental damage from soya based milk or meat substitutes.

Overall, we feel that these commitments represent a holistic set of concrete actions which address the issue of red meat and dairy consumption in the round and take account of the retailers' own business aims and context.

### **8.3 Recommended Policy Changes**

We believe that government has a key role to play in *enabling* market transformation with strong long term signals to farmers, retailers and consumers alike. In relation to reducing the amount of red meat and dairy the UK consumes, we feel there are five broad requests of DH , Defra, DECC and The Home Office:

- 1) Strengthen and update the FSA nutritional guidelines to support both nutritional and One Planet Food concepts defining and publicising a "Live Well" plate: to date the plate has focused solely on healthy eating, yet it is the strongest reference used by retailers and citizens alike when seeking direction on their diet.
- 2) Provide definitive clarity on lifecycle analysis boundary scope and methodology requirements for red meat and dairy to accelerate foot-printing amongst all retailers and their suppliers: this would provide a "level playing field" to overcome business fear that they will be penalised for leading in this as yet ambiguous and complex technique.



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- 3) Catalyse the reform of farming to support GHG reduction and sustainability, including acceleration/refinement of environmental stewardship under the CAP, provision of a bio-methane equivalence infrastructure, and the setting of a clear direction and vision for farming of the future in the context of climate change mitigation and adaptation needs: this will support farmers financially and practically.
- 4) Include farming in national GHG targets and lobby for international agreement to do the same: a strong signal such as this is required to maximise the speed of action amongst players at all stages of the food value chain.
- 5) Revisit taxation of food to incentivise the adoption of foods which are healthy and less harmful to the environment: we feel that the current VAT system is anachronistic and should be updated to reflect current strategies for reducing both obesity and climate change.

### **8.4 Other Recommended Food Market Changes**

As indicated in chapter two, the food market has many stakeholders and influencers. In the main part of our study we address the key ones, in particular retailers and customers, and draw on insights around farming and processing as required. However, we believe that there are other parties who have a part to play in the transformation of our diets, notably key opinion formers (KOFs) and celebrities/the media, as well as sector associations who collaborate across individual parties in each stage of the food value chain.

If Britain is to revise its perceptions of healthy eating and embrace meals and snacks without meat or dairy, it will need to be underpinned by medical sign-off. Nutritional science is a complex area and has been subject to study over many years. Government, hospitals and the press rely on experts to inform their policies, practices and communications about what we should be eating. WWF should familiarize itself with this landscape and build bridges to the KOFs as part of its overall influencing strategy. There is evidence of a linkage between red meat consumption and cancer incidence, but this is poorly understood by the public (BBC, 2009). WWF might wish to consider forming alliances with cancer charities, who are actively promoting this linkage as there may be synergies between the two campaigns.

In addition, our interviews with the retailers confirmed the power of media and celebrities to drive significant shifts in consumption in a very short time if they are on topics relevant to customers. We believe there is potential to educate celebrity chefs on the environmental issues relating to food and if not bring them on side, at least neutralise any negative impact they might have on efforts to reduce sales by inadvertent promotion of red meats or dairy. This will be tricky since many use red meat and



dairy as the focal point of their recipes and cooking, but we feel that the impact is so large, that it must form part of any holistic plan for action.

Our research also found that there are multiple industry/farming associations and that for farming or processors these are a means of coming together for collective power (app. 11.4). Major retailers, on the other hand, tend to prefer to create proprietary standards and certifications. None-the-less, we feel that there is mileage in encouraging the key bodies to incorporate low carbon farming standards into their schemes since they have broad reach.

Furthermore, we believe that the complexity and interdependency of today's issues and the speed with which change must be affected will require a new form of collaboration in the food market, with a greater degree of open-mindedness and creativity than at any point in the past. The government should foster a debate to allow 'backcasting' in the broad set of stakeholders to support a move away from the typical adversarial stance of players in the market, to one of collective purpose and vision.

## 9. Conclusions

### 9.1 Overall conclusions

This report undertook to establish strategies for reducing consumption of red meat and dairy in UK and with the overall aim of lessening the environmental burden of food consumption in the UK. Our perspective has been challenged. At the outset of our investigation, the team hypothesized that with a growing UK population and general food consumption on the increase, bringing food related GHG emissions broadly into line with the targets set for other sectors of our economy in the Climate Change Act would be a near-insurmountable problem. Whilst we imagined that short term supply chain efficiencies would afford incremental reductions, the more distant goals would require as yet unproven technologies, akin to a second green revolution, especially in farming. We expected to find consumer attitudes entrenched, and with little hope for what we believed would need to be a wholesale behavioural change.

Instead, we found that there are existing farm practices which can act as a best practice and which, if adopted across the whole livestock sector, would go a long way to solving the problem of food and GHG. And, whilst we found that red meat and dairy are a ubiquitous part of the everyday British diet, there are latent consumer perceptions about what constitutes a healthy diet and a desire to reduce intake of both dairy and meat which could catalyse change more easily than we had at first thought. This is encouraging.



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We found the retailing ‘gatekeepers’ in the food chain to be active in combating climate change through energy efficiency within their stores and office operations, as well as through optimization of resources in their immediate supply chain. However, retailer initiatives relating to farming are in their infancy and have yet to “catch up” with the climate change agenda in the context of longer-standing concerns around food safety/quality, animal welfare, and pesticide control. We do not believe that retailers are dragging their heels, but that “sustainable, low carbon farming” will and should be the next generation of their environmental programmes. Clear direction is needed from government if a wholesale transformation is to be achieved across the sector quickly enough to meet WWF’s GHG objectives. Our recommendations ask the retailers to step up and take ownership of the end-to-end impacts of their core product (food) with significant change in their extended network of beef, lamb and dairy suppliers, an acceleration of their own operations to carbon neutrality, and an education of their customer base around dairy and red meat volumes, and alternatives. We do not believe this will be detrimental to their business: indeed, we consider there to be genuine business opportunities for them in cost reduction through future carbon price avoidance and through the formation of sizeable new categories which tap into and provide for latent consumer aspirations.

### ***9.2 Recommended priorities for further research***

We believe that this investigation moves the debate about One Planet Food forward considerably. On the other hand, we were personally frustrated that we were unable, in the timeframe for our project, to address associated issues and would recommend five additional areas of possible research to support and deepen our collective understanding of this topic:

- 1) *Net impacts refinement*: although we have estimated approximate net GWP reductions associated with the volumes of red meat and dairy that will be prevented, this was based on a simplistic but educated guess about consumer switching into one or two alternative food stuffs. In reality, this is likely to be far more fragmented and robust research into probable consumer substitutes would both refine the quantification of GHG reductions, and also inform direction for the required alternatives markets.
- 2) *Broader sustainability impact assessment*: Our project focused on climate change from the point of view of GHG, without a more balanced consideration of all environmental aspects, including global water and biodiversity conservation. Further work around the likely impact on the livestock and dairy sectors in UK and an analysis of impacts and recommended actions of using red meat/ dairy substitute products from Britain or overseas would also be required.



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- 3) *Sustainable/low carbon farming standards*: We identified several standards in use by retailers, and believe that a more detailed review of these, their usage and potential to become or to incorporate industry-wide standards supporting low carbon farming, water conservation and biodiversity protection objectives would be valuable. In particular, since WWF will focus its resource on working with the larger retailers on a transformational agenda, a “floor” on farming standards might enable a cost effective, more widespread impact across all retailers and processors in the food chain.
- 4) *“CAP and food market dynamics”*: It is evident that farming will need to undergo radical change in the next 40 years and the Foresight report on Global Food and Farming Futures is eagerly awaited. But, we believe that the Common Agricultural Policy is key to unlocking deep change in farming, and a study into how the CAP and global trade agreements put the brakes on farming reform would enable WWF to lobby at both national/EU levels to build momentum behind a ‘new way’.
- 5) *Red meat and dairy in food service*: Our investigation has focused on multiple retailers, but there are also some key linkages of red meat and dairy to the food service channel, and interdependencies in consumer behaviour from one to the other. One might reasonably speculate that out-of-home cheese burgers and large milk-infused latte coffees may be an area to target, but a comprehensive review of food service should be undertaken to understand the size and nature of any issues.





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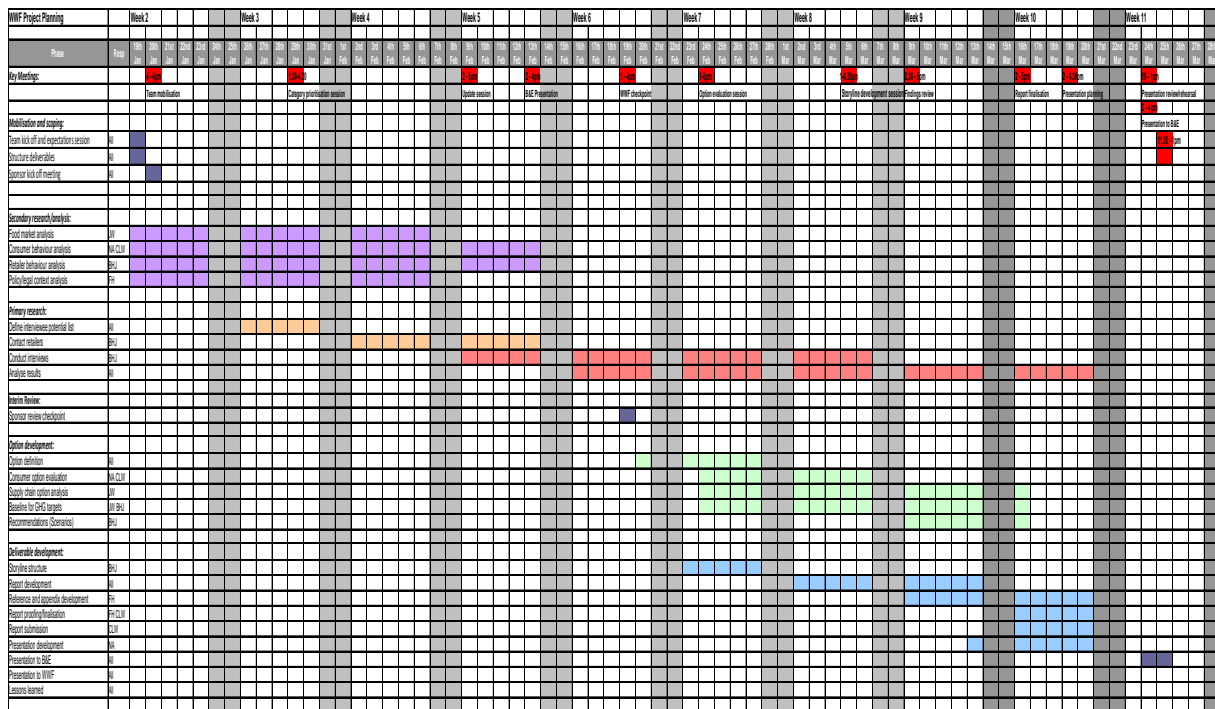


## 11. Appendices

### 11.1 Business Planning Methodology and Project Plan

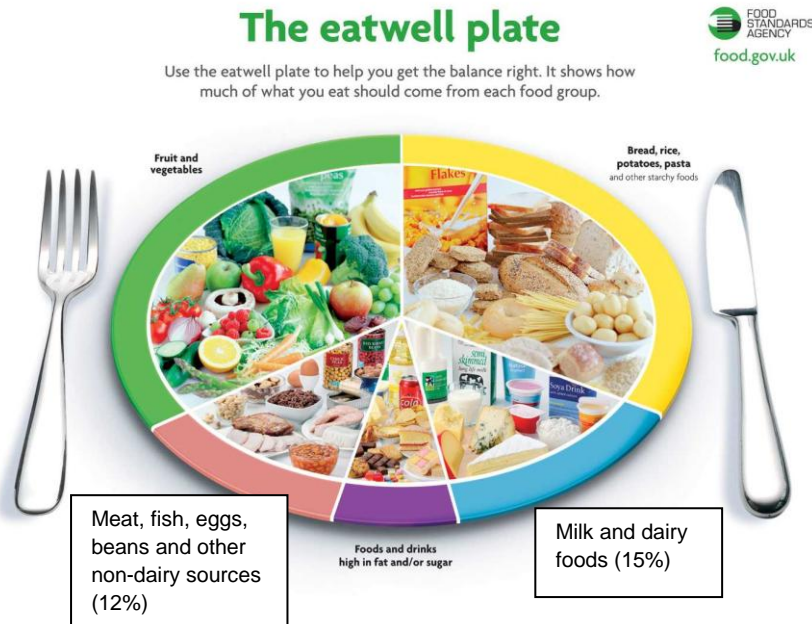
This project was spread over ten weeks. At the outset we developed a project plan and Gantt chart to map the three key phases of work required to complete the business plan with the allotted time. The four work phases were as follows: Phase 1: Project kick off, data gathering and analysis, preparation for research and preliminary option identification; Phase 2: Retailer and consumer research Phase 3: quantitative baseline development and option definition and evaluation; Phase 4: Synthesis of findings, report and presentation development, final deliverables and presentations.

Given the limited time allocation guideline of one day per week, we used a “divide and conquer” approach, dividing the effort into discrete workstreams for individual team members and holding structured workshops to share and discuss findings, make decisions and agree next steps.





## 11.2 Eat Well Plate



Source: FSA (2007)

Launched in 2007, the 'eat-well plate' represents the government's advice on nutrition for UK citizens (FSA, 2007). A 'visual tool that illustrates the types and proportions of foods that make up a balanced diet, it updates the previous illustrative model, the 'Balance of Good Health' and is split into segments that reflect the 5 key food groups. The FSA encourage the public to eat more fruit and vegetables, as well as starchy foods (including bread, rice, potatoes and pasta), recommending that each of these contribute 33% of our daily diet. The FSA also advise a low intake of food and drink that falls into the high in fat/and/or sugar category, setting the target at 8%. In terms of recommended guidelines for milk and dairy foods consumption, the FSA suggest eating 3 servings a day from this food group. The stipulate a 'portion' as circa 200ml glass of milk, a 150g pot of yoghurt, or 30g serving of cheese (matchbox size). They suggest that milk and dairy should constitute 15% of the plate in total. For meat, fish, eggs, beans and other non-dairy sources, the FSA recommend eating 1-2 portions of fish weekly, of which one portion should be oily fish. Overall, they suggest that this food group should constitute 12% of the plate. In addition, the World Cancer Research Fund recommend that, for health reasons, only moderate amounts of red meat (including beef, lamb and pork) should be eaten i.e. less than 500g (18oz) weekly (World Cancer Research Fund, 2009). For both red meat and dairy options, the FSA advises choosing reduced fat options where possible and avoiding processed meats such as bacon, ham, salami, corned beef and some sausages (FSA, 2008).



## 11.3 Retailer Interview Guide; and Interviewee List

### CSR representative interview questions

Section 1. CSR health and environmental initiatives:

“What are the main initiatives for your company in relation to your customers’ overall health?”

“What are the main initiatives for your company in relation to the environment?”

Section 2. Policy/focus areas for diet:

“What, if any, advice do you offer your customers about their food intake and diet?”

“Do you have any initiatives or research under way or planned about customer diet? If so, what are they?”

“What changes do you anticipate and what is driving them?”

Section 3. Perspective on beef/lamb or dairy :

“Research shows that ruminant meat, such as lamb and beef, and dairy products produce more greenhouse gases than most other types of food. Do you agree with this ?

Do you think people could be persuaded to consume less of them, perhaps by substituting other types of food and drink? If so, why ? If not, why not ?”

Do you plan to communicate with customers about the environmental, social or health-related impacts of the food that you sell? If so, please give details.

Section 4: Perspective on sustainable farming.

“Have you heard of sustainable farming and what does it mean to you?”

Does your company have any initiatives which are exploring or developing this ? If so, what are they ?

Would you progress such an initiative as part of your supply chain operations efficiency or to communicate it as a benefit to customers ?






Retailer	Role
Retailer A	Senior Buyer for Poultry, Fish and Eggs
Retailer B	General Manager, Corporate and Social Responsibility
Retailer C	Head of Ethical and Sustainable Sourcing
Retailer D	Corporate and Social Responsibility Head



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## 11.4 Key Associations and Standards

There are also some key industry wide initiatives that could be leveraged in order to create change in retailers toward a more sustainable food vision. This leverage may include encouraging all retailers to sign up to these key associations and standards, promoting further standards within the key associations (i.e. Global G.A.P. and LEAF) that incorporate stringent carbon measurements and targets into their agricultural standards. Sedex might also be able to enforce stronger deforestation, water and biodiversity standards in their ethical data exchange.

Organisation	Location	A Brief Introduction	Source
 The Food and Drink Federation Commitment	Nationwide, including London	Launched at the beginning of 2008 by Lord Rooker, Minister for Sustainable Food and Farming and Animal Health, in conjunction with Envirowise. They aim to reduce water use by 20% by 2020. The signatories to date are all multinational corporations. No retailers appear to have signed up.	<a href="http://www.fdc2020.co.uk/fhc/cms">http://www.fdc2020.co.uk/fhc/cms</a>
 The global partnership for Good Agricultural Practice (G.A.P)	Head office in Germany. Also based in the UK, Germany, Spain, South Africa, Uruguay & China	Formerly EurepGAP, GlobalGAP is a private sector body that sets voluntary standards for the certification of agricultural products around the globe. Their aim is to establish ONE standard for Good Agricultural Practice (G.A.P) for a pre-farm-gate standard. All UK retailers are members, as are most European multi-grocers. The standard is in the form of a business-to-business label and is therefore not directly visible to consumers. Certification is carried out by more than 100 independent and accredited certification bodies in more than 80 countries. It is open to all producers worldwide.	<a href="http://www.globalgap.org">http://www.globalgap.org</a>
 LEAF: Linking Environment And Farming	Warwickshire based	LEAF (Linking Environment And Farming) was set up in 1991 and is based at the National Agricultural Centre, Warwickshire. The governing body is an Advisory Board made up of some thirty members representing national government departments, farmers, supermarkets, conservation, environment and consumer groups. LEAF promotes Integrated Farm Management (IFM). This includes traditional farming methods including crop rotations, with modern methods including pesticides and fertilizer use only when absolutely necessary to keep animals and crops healthy. The organisation enables farmers to take up IFM by providing them with a detailed self-assessment audit and a wide range of technical information on IFM and education on how to put it into practice.	<a href="http://www.leafuk.org">http://www.leafuk.org</a>
 Red Tractor	London based	Launched by the Prime Minister in 2000, Red Tractor are an independent organisation that ensures that their farmers are independently inspected to ensure that they meet quality standards on issues such as animal health and welfare and what farmers were doing to protect the environment. Providing standards are met, they credit products with their logo.	<a href="http://www.redtractor.org.uk">http://www.redtractor.org.uk</a>
 Sedex: Supplier Ethical Data Exchange	London based	A not for profit organisation that connects businesses and their global suppliers to share ethical data and enabling continuous improvement in ethical performance. Their primary focus is on labour standards. They are now expanding to include some environmental and business integrity issues. All UK retailers are members, as are most European multi-grocers.	<a href="https://www.sedex.org.uk">https://www.sedex.org.uk</a>



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## 11.5 Options – Eat Well Plate Analysis – Base Data and Current Consumption

NDNS Diet Analysis : week's consumption	g one week	g pa
Pasta rice cereal	507	26364
Bread	706	36712
Breakfast cereal	203	10556
Biscuits cakes buns	231	12012
Puddings	142	7384
Milk	1430	74360
Other milk and cream	54	2808
Cheese	106	5512
Yoghurt and fromage frais	153	7956
Eggs and egg dishes	133	6916
Fats and oils	86	4472
Meat and meat dishes	1125	58500
Fish and fish dishes	217	11284
Veg and veg dishes	943	49036
Potatoes	734	38168
Savoury snacks	52	2704
Fruit	666	34632
Nuts	15	780
Sugars and preserves	106	5512
Confectionary	82	4264
Misc	373	19396
<i>All food</i>	<i>8064</i>	<i>419328</i>

UK Dietary Analysis against Eat Well Food Groups	NDNS g in week	% Split	% Recommended (EW)	Actual	Differential	Recommended g
Fats and sugars	1072	13%	8%	13%	77%	605
Non dairy protein	1490	18%	12%	18%	61%	927
Dairy	1743	22%	15%	22%	44%	1,210
Starch	2150	27%	33%	27%	-19%	2,661
Veg and fruit	1609	20%	33%	20%	-40%	2,661
<i>Total</i>	<i>8064</i>	<i>100%</i>	<i>100%</i>	<i>100%</i>	<i>NA</i>	<i>8,064</i>



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## 11.6 Options – Eat Well Plate Analysis – Variance Analysis and GWP Reduction Potential

NDNS based meat (incl meat dishes) variance to benchmark	Absolute ave g in week NDNS pp	Benchmark g pp	Variance %
Eat well plate recommended % protein converted to g in week	1125	927	21%
<b>Eat well plate recommended % protein converted to g in week less fish recommendation of 2 portions per week @ 150g per portion FSA portion guideline of 140g)</b>	<b>1125</b>	<b>647</b>	<b>74%</b>
NDNS based all dairy categories variance to benchmarks	Absolute g in week NDNS	Benchmark	Variance %
<b>Eat well plate recommended % dairy converted to g in week</b>	<b>1743</b>	<b>1210</b>	<b>44%</b>

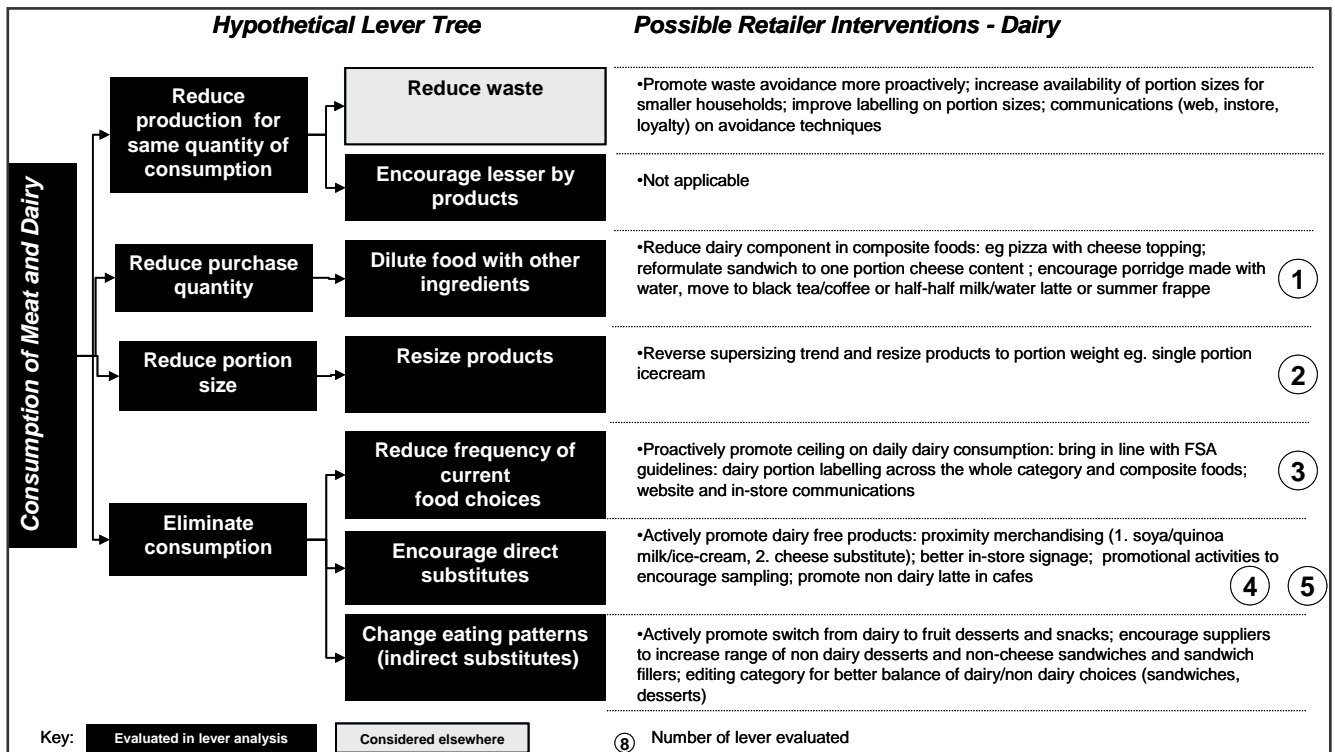
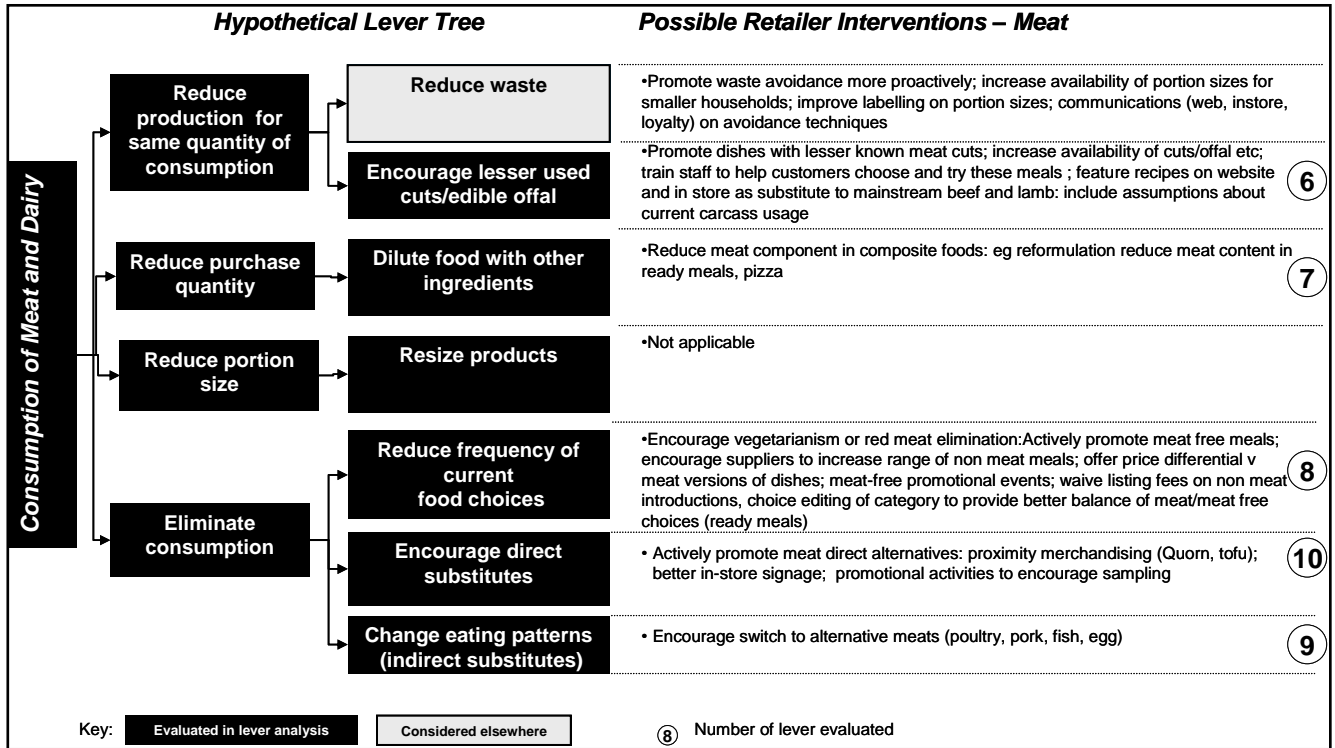
Beef, lamb, pork GWP reduction potential	Red meat '000 tonnes 2008	Red meat '000 tonnes 2020	Red meat '000 tonnes 2050
Total market consumption/projections - beef and lamb	1,502	1,564	1,762
Consumption at Eat well plate protein proportion	1,238	1,289	1,452
Consumption at Eat well fish/meat protein proportion	864	900	1,014
Reduction if at Eat well plate protein proportion	264	275	310
Reduction if at Eat well fish/meat protein proportion	638	664	748
	<b>CO2 eq</b>	<b>CO2 eq</b>	<b>CO2 eq</b>
Red meat GWP per 000 tonnes - beef/lamb	19,120	19,069	19,072
GHG reduction from meat at Eat well protein proportion CO2 eq	5,045,220	5,239,403	5,903,654
<b>GHG reduction from red meat at fish/red meat Eat well proportion CO2 eq</b>	<b>12,192,871</b>	<b>12,662,155</b>	<b>14,267,463</b>
All dairy categories GWP reduction potential	Dairy 000 tonnes 2008	Dairy 000 tonnes 2020	Dairy 000 tonnes 2020
Total market consumption/projections - dairy	13,375	12,530	10,643
Consumption at Eat well plate dairy proportion	9,282	8,696	7,386
Reduction if at Eat well plate proportion	4,093	3,834	3,257
	<b>CO2 eq</b>	<b>CO2 eq</b>	<b>CO2 eq</b>
Dairy GWP per 000 tonnes CO2 eq	1,470	1,380	1,380
<b>GHG reduction from dairy at Eat well proportion CO2 eq</b>	<b>6,016,816</b>	<b>5,291,585</b>	<b>4,494,680</b>
<b>GHG potential reduction from combined meat and dairy CO2 eq</b>	<b>28,087,500</b>	<b>28,211,734</b>	<b>30,320,645</b>





# Strategies for reducing the climate impacts of UK red meat/dairy consumption

## 11.7 Options – Lever Trees





# Strategies for reducing the climate impacts of UK red meat/dairy consumption

## 11.8 Options – Meat Analysis

Options to Reduce Red Meat Consumption - Avoiders, Reducers, Meal Reformulation, Meat Alternatives, Edible Offal	2008	2020	2050
<b>Meat avoiders (beef and lamb)</b>			
- Additional people %	0	0.02	0.04
- Additional people abs	0	1,326,000	3,212,000
Meat avoided g	-	31,276,663,095	70,497,140,274
Meat avoided tonnes	-	31,277	70,497
GHG avoided Co2e	-	596,759	1,345,085
<b>Meat reducers (beef and lamb)</b>			
- Reducers %	0	0.16	0.32
- Reducers abs	-	10,608,000	25,696,000
- Reduction proportion pp ( %)	0	0.25	0.33
- Meat avoided g	0	62,553,326,190	186,112,450,323
- Meat avoided tonnes	0	62,553	186,112
GHG avoided Co2e	-	1,196,020	3,558,470
<b>Ready meal reformulation/dilution (beef and lamb)</b>			
- Processed beef market volume through multi grocers	347,728	376,059	457,401
- Processed lamb market volume through multi grocers	26,609	24,579	20,097
- % Reduction in average beef content	0	0.15	0.25
- % Reduction in average in lamb content	0	0.15	0.25
- Beef avoided tonnes	0	56,409	114,350
- Lamb avoided tonnes	0	3,687	5,024
GHG avoided - ready meal meat dilution - beef		1,076,281	2,181,803
GHG avoided - ready meal meat dilution - lamb		70,160	95,612
GHG avoided Co2e	-	1,146,441	2,277,415
<b>Additional red meat to quorn/other meat alternatives switch</b>			
Estimated meat alternatives volumes (t)	26,337	47,298	204,417
- % market share of soya/other meat alternative	0%	3%	13%
- Meat avoided tonnes	-	47,298	204,417
-GHG avoided CO2e	-	901,906	3,898,615
<b>Edible offal uptake</b>			
- Expected edible offal market volumes	166,586	130,594	71,062
- Targeted edible offal market volumes	166,586	187,561	240,000
- % Uplift	0	13%	44%
- Increased volume offal/reduction prime meat (tonnes)	-	56,967	168,938
- Ratio of overall meat avoided (tonnes)	0	25%	50%
- Avoided meat from uptake of edible offal	0	14,242	84,469
-GHG avoided CO2e		271,575	1,610,980



# Strategies for reducing the climate impacts of UK red meat/dairy consumption

## 11.9 Options – Meat Analysis Assumptions

<b>Red Meat Reduction and Dilution Analysis - Assumptions and References</b>
<b>Meat avoiders (beef and lamb)</b>
Lever is based on hypothesis that there is a natural growth in meat avoiders based on increased health awareness and understanding
We assume that meat reducers and avoiders are mutually exclusive
13% of consumers tending to eliminate meat from diet (Mintel Meat Free foods 2004)
But in 2004 6% were vegetarian and 5% pescarian (Keynote Vegetarian Foods 2007): ie 2% are additional meat avoiders
These 2% of meat avoiders could be persuaded to eliminate meat by 2020: we consider this to be a conservative increase
This would remove 2% x population x per capita red meat consumption
We assume that this number could be doubled between 2020 and 2050 as information about health and red processed meat is more widely known
We assume that these people would eliminate their red meat consumption, each reducing tonnage by per capita forecasts for 2020, 2050
<b>Meat reducers (beef and lamb)</b>
Lever is based on hypothesis that promotion (media, instore) could increase numbers of meat reducers
We assume that in the mid term (to 2020) most eating behaviours are health driven, but by 2050 they include environmental consideration
29% trying to reduce meat in 2001 (Realeat report cited in TGI Keynote 2007 veg foods)
13% of consumers tending to eliminate meat from diet (Mintel Meat Free foods 2004)
Therefore we assume that 29-13% ie 16% of consumers are meat reducers by 2020
We assume the number of people trying to eliminate meat will rise to 2050 by 32% (based on DEFRA pro-environmental framework, 2008)
We use DEFRA's pro-environmental report which identifies most pro-environmental segments as Positive Greens, 18%, Concerned Consumers, 14% ie total 32%
We assume these people will reduce their meat content and replace with existing alternatives - vegetables, existing direct substitutes - based on increased awareness of environmental and to a lesser extent health issues
We also assume that these people would reduce consumption by 1/4 by 2020 and 1/3 by 2050
<b>Meat ready meals reformulation</b>
Lever is based on hypothesis that meat based meals could be reformulated to reduce consumption per meal in line with "recommended portion size"
We assume ready meals mostly sold through retail which represents 84% of total market (TNS 2007 cited in AHDB UK Yearbook 2008)
Use volume split for fresh and processed meat from Agriculture and Horticulture Development Board (AHDB), UK Yearbook 2008 - Meat and Livestock, 2008
We assume that the split of fresh to processed meat is equivalent across all retailers
We assume that a portion of meat is weekly WCRF guideline of 500g / frequency of 3 ie c. 166g in line with other dietary portion indications (150g) (Lighter Life 2009)
An illustrative set of primarily red meat based ready meals yielded an average meat weight of 40% or 193g (Asda Website April 27th 2009)
We assume that meat in current meals could be reduced by 15% meat content by 2020 and still be in line with WCRF portion guidelines and not adversely impact customer expectations
By 2050 we assume advance in technology, or behavioural change will allow this reduction to be 25%
<b>Red meat to quorn/ other meat alternatives</b>
Lever is based on hypothesis that additional meat reduction could be achieved amongst consumers not yet considered with investment in the direct substitute market to give an improved and comparable taste/sensory experience to meat
Assumes reduction from meat alternatives is incremental to reduction from that through an increase in meat reducers above
Uses red meat market value as base (TNS 2007) @ £5320
Uses vegetarian mince, grill, burger and roast substitute market value (Keynote 2007) @ £93.3m
Assumes volume ratio of substitutes to standard meat = ratio in value terms (1.8%)
Uses weighted ave CAGR (2004-7 Keynote 2007 Veg Foods) for key meat substitute products as forecast future growth (3.4%)
Assumes promotion innovation to improve customer experience could increase CAGR
45% of households are reducing meat intake: Mintel Meat Free Foods Dec 2004
Assumes that meat reducers reach 45% pop'n by 2050 (household influence on all residents) minus meat reducers above
Assumes meat substitute causes decrease of regular meat on 1:1 ratio
<b>Edible offal uptake</b>
Lever is based on hypothesis that encouraging people to eat edible offal from cattle and sheep will increase prices and incent pet food manufacturers to find non meat ingredients
Uses edible offal market volumes as base (Bokern Murphy 2008)
Assumes consumption can return to 1990 levels (demonstrated as possible by previous behaviour) by 2050, and increases on straight line basis
Assumes no constraint on availability of beef and lamb offal
Assume pet food manufacturers replace 25% and 50% of edible offal from pet food in 2020, 2050 respectively
Assumes GWP of edible offal is weighted average for beef and lamb ie 12.96 CO2e tonnes in 2020, 12.97 CO2e(t) in 2050



# Strategies for reducing the climate impacts of UK red meat/dairy consumption

## 11.10 Options – Dairy Analysis

Options to Reduce Dairy Consumption – Dilution, Portion Control, Alternatives	2008	2020	2050
<i>Cheese based composite meal reformulation/dilution</i>			
-Av cheese weight in ready meals, pizza, chesse sandwich (g)	55.5	30	30
- % reduction in cheese content		46%	46%
-% population consuming		50%	100%
- Cheese avoided tonnes		162,856	394,489
-GHG avoided CO2e		162,856	394,489
<i>Dairy portion control - ice cream sticks or bars</i>			
- Ave serving size in icecream sticks/bars (ml)	86.9	30	30
- % reduction in dairy content (awareness driven)		65%	65%
-% population switching to new portion size		25%	50%
- Icecream avoided tonnes		242	587
-GHG avoided CO2e		242	587
<i>Dairy portion control - milk</i>			
- Ave daily milk consumption (breakfast, drinking, hot drinks) (ml)	250	200	200
- % reduction in dairy content (awareness driven)		20%	20%
-% population switching to new portion size		25%	75%
- Milk avoided tonnes		183,357	888,298
-GHG avoided CO2e		183,357	888,298
<i>Dairy to soya switch - cheese</i>			
Estimated retail cheese volumes in tonnes	2,152,716	2,367,915	3,004,795
expected % market share of soya/other alternative	0.0%	0.0%	0.0%
target % market share of soya/other alternative		0.0%	0.1%
- Cheese avoided tonnes		9	608
-GHG avoided CO2e		9	608
<i>Dairy to soya switch - milk</i>			
expected retail milk volumes in tonnes	4,329,979	4,291,315	1,720,848
expected % market share of soya/other alternative	3.8%	10.3%	17.5%
target % market share of soya/other alternative		10.3%	71.4%
- Milk avoided tonnes		490,899	4,297,801
-GHG avoided CO2e		490,899	4,297,801



# Strategies for reducing the climate impacts of UK red meat/dairy consumption

## 11.11 Options – Dairy Analysis Assumptions

<b>Dairy reduction and dilution - Assumptions and References</b>
<i>Cheese based composite meal reformulation/dilution</i>
We assume a projected population of 61.4m in 2008, 66.3m in 2020 and 80.3m in 2050, based on 2005 ONS population data (Office of National Statistics, 2005, <a href="http://www.statistics.gov.uk/cci/nugget.asp?id=1352">http://www.statistics.gov.uk/cci/nugget.asp?id=1352</a> , viewed 03.03.09)
76% of people eat cheese sandwiches, on average 3 times per week (Lunchtime Eating Habits, Mintel Leisure Intelligence, 2005)
70% of the population eat ready meals, on average twice a week (Chilled Ready Meals, Mintel Market Intelligence, 2004)
66% of people eat pizza, once a week (Pizza, Mintel Market Intelligence, 2005)
We assume the average portion sizes of cheese occasions as; 42.5g in a cheese sandwich, 46.2g in a ready meal and 68.2g in a pizza. These assumptions are drawn from the average cheese contained in a range of pre-prepared foods.
We assume consumers maintain current eating patterns in number and frequency of ready meals, pizzas and cheese sandwiches between 2008 and 2050
We assume that the portion size of cheese in ready meals, pre-prepared sandwiches and pizzas is reduced to 30g by 2020, in line with official guidelines from the Eat Well plate.
We assume 50% of consumers will choose to purchase products that contain smaller portions of cheese by 2020, for health reasons
We assume 100% of consumers choose to purchase products that contain smaller portions of cheese by 2050, for health reasons
<i>Dairy portion control - ice cream sticks or bars</i>
We assume a projected population of 61.4m in 2008, 66.3m in 2020 and 80.3m in 2050, based on 2005 ONS population data (Office of National Statistics, 2005, <a href="http://www.statistics.gov.uk/cci/nugget.asp?id=1352">http://www.statistics.gov.uk/cci/nugget.asp?id=1352</a> , viewed 03.03.09)
Single serve ice cream sticks/bars were used in the working because the portion size could not be accurately determined for tubs/larger containers
59.8% of people consume ice cream in the form of sticks or bars and consume on average one ice cream stick per week (it is recognised this is a seasonal pattern) (Ice Creams and Frozen Desserts, Keynote 2007)
We assume the average portion sizes of ice cream bars/sticks is 79ml. This assumption is drawn from the average portion size of a range of individual serve ice cream products
We assume manufacturers reduce individual portion size of ice cream sticks and bars to 30g, in line with Eat Well plate FSA guidelines
We assume the consumers continue to eat the same number and frequency of ice cream sticks or bars between 2008 and 2050
We assume 25% of consumers choose to purchase ice cream products with smaller serving size by 2020, for health reasons
We assume 50% of consumers choose to purchase ice cream products with smaller serving size by 2050, for health reasons
Single serve ice cream sticks/bars were used in the working because the portion size could not be accurately determined for tubs/larger containers
<i>Dairy portion control – milk</i>
We assume a projected population of 61.4m in 2008, 66.3m in 2020 and 80.3m in 2050, based on 2005 ONS population data (Office of National Statistics, 2005, <a href="http://www.statistics.gov.uk/cci/nugget.asp?id=1352">http://www.statistics.gov.uk/cci/nugget.asp?id=1352</a> , viewed 03.03.09)
85.2% of people consume ready to eat (RTE) cereals, on average 4 times per week and 47.7% of people consume hot cereals on average twice a week (Breakfast Cereals, Keynote 2007)
We assume 30% of the population consume a glass of milk, on average 4 times per week
70% of the population drink tea/coffee, on average three times per day ('How do you drink yours?', Times Online, 28 January 2008, <a href="http://www.timesonline.co.uk/tol/life_and_style/health/article3260043.ece">http://www.timesonline.co.uk/tol/life_and_style/health/article3260043.ece</a> (viewed 03.03.09)
We assume an average portion size of 119ml for RTE cereal, 243ml for hot cereal, 20ml for tea/coffee and 200ml serving size for a glass of milk. Average volume of servings derived from a selection of existing convenience foods and from preparation guidelines on packaging of complementary products where information was available
We assume consumers eat a bowl or hot or cold cereal or a glass of milk and three cups of tea/coffee per day, to give an estimated average daily intake of 250ml of milk
We assume that consumers maintain current eating patterns of cereal, tea/coffee and milk snacks between 2008 and 2050
We assume the government launches high profile campaign in 2015 to encourage consumers to reduce total daily milk consumption to 200ml, in line with Eat Well plate guidelines
We assume 25% of consumers choose to reduce daily milk intake in line with guidelines by 2020, due to need for behavioural change and allowing for consumer autonomy in consumption
We assume 75% of consumers choose to reduce in line with guidelines by 2050.
<i>Dairy to soya switch – cheese</i>
Cheese consumption will increase from 3,794,000 tonnes in 2008 at a CAGR of 0.8% between 2008 and 2050 with no intervention (Agriculture in the UK 2007, Defra. URL: <a href="https://statistics.defra.gov.uk/esg/publications/auk/2007/Table%205-17.xls">https://statistics.defra.gov.uk/esg/publications/auk/2007/Table%205-17.xls</a> )
We assume that 56.7% of total cheese in volume is sold through retail channels
We assume there is currently no soya/other alternative to cheese available in multiple retailers
We assume manufacturers can produce an adequate soya/other cheese substitute
We assume that cheese alternatives could achieve a CAGR of 20.3% between 2008 and 2020 and 15% between 2020 and 2050, based on the assumption that cheese alternatives could build on previous CAGR realised for soya milk products with high profile promotion by retailers (Euromonitor International Health and Wellness – packaged food – UK February 2008)
We assume that in response to a growth in consumption of soya/other alternatives to cheese, the conventional cheese market would reduce by -3% between 2020 and 2050
<i>Dairy to soya switch - milk</i>
Milk consumption will increase from 6,637,000 tonnes in 2008, at a CAGR of -0.07% between 2008 and 2050 with no intervention (Agriculture in the UK 2007, Defra. URL: <a href="https://statistics.defra.gov.uk/esg/publications/auk/2007/Table%205-17.xls">https://statistics.defra.gov.uk/esg/publications/auk/2007/Table%205-17.xls</a> )
We assume that 65.2% of total liquid milk in volume is sold through retail channels
The value of soya milk market represented 3.9% of the value of the conventional milk market in 2006 (Euromonitor International Health and Wellness – packaged food – UK February 2008). We assume the volume ratio of 3.9% is equivalent to the value ratio, to give an estimated 261,000 tonnes of soya milk consumed in 2008.
We assume the soya milk market is expected to grow at a CAGR of 9.3% between 2008 and 2020 and 2% between 2020 and 2050 as the market matures to account for 17% of the total 'milk' consumption. (Euromonitor International Health and Wellness – packaged food – UK February 2008). This is in line with the c. 17% of people that are either lactose allergic or believe they are lactose intolerant (FSA (2007) Omnibus Research Report Prepared for FSA by COI, April 2007)
We assume that high profile promotion of soya milk by retailers could maintain a higher CAGR between 2020 and 2050 of 8% and that as the market grew the conventional milk market would reduce during this period by -3%



# Strategies for reducing the climate impacts of UK red meat/dairy consumption

## 11.12 Options – Prioritisation

Lever Ease of Implementation (vis a vis key stakeholder groups) Analysis	Consumers	Retailers	Manuf'er	G'vt	Overall	Comments on likely reaction, excepting in relation to climate change mitigation impact which is considered elsewhere
1. Dairy dilution - composites	3	3	3	5	3.5	C: Requires little consumer behavioural change and maintains original formats R: No loss of revenue although risks customer dissatisfaction with reformulated product M: Innovation opportunity G: aligns with Eat well plate goal of dairy at 15%
2. Dairy portion control - deserts	1	1	1	3	1.5	C: Smaller ice creams likely to meet strong resistance R: Revenue loss from smaller products at lower prices M: Lost revenue G: Aligns with dairy 15% of plate but likely to get backlash from manufacturing and retail
3. Dairy dilution - liquids	3	1	1	3	2.0	C: Requires moderate consumer behaviour change only R: Revenue loss in lower milk sales M: Volume loss G: Aligns with move towards Eat well plate
4. Dairy to non dairy switch - cheese	1	1	3	3	2.0	C: Requires significant consumer shift to new product type R: Low interest if low consumer demand M: Innovation opportunity G: Probably requires investment/incentives for innovation
5. Dairy to non dairy switch - milk	5	5	3	3	4.0	C: Like to like product already established and switch is "on trend" R: High interest if consumer up-take as represents revenue opportunity M: Innovation opportunity but likely to meet resistance in dairy cooperatives G: Helps move towards Eat well plate but likely to get backlash from dairy industry
6. Edible offal uptake	1	3	3	3	2.5	C: Mostly seen as unpalatable by consumers, even if niche trend R: Opportunity to differentiate with interesting categories, especially for up market retailers M: Likely to command higher price than to pet food so upselling opportunity G: Encourages carcass utilisation and supports British farming
7. Ready meal reformulation/dilution (beef and lamb)	3	3	3	5	3.5	C: Does the work for the consumers so well received providing not too "mean" R: Relatively easy to do, providing customers support it and reduces overall costs, improving margin M: Relatively easy to do and reduces overall costs, improving margin G: Supports move towards Eat well plate
8. Meat avoiders (beef and lamb) - natural trend	5	5	5	5	5.0	C: Natural trend so no self selecting R: Supportive of customer desires M: No change per se G: High alignment with move to Eat well plate
9. Meat reducers (beef and lamb) - awareness/education driven	1	1	1	3	1.5	C: Requires "deprivation" as skip meat meals R: Directly reduces revenues from core product M: Reduces sales and endangers livelihoods G: High alignment to Eat well plate but likely backlash from farmers
10. Add. meat to quorn/meat alternatives switch - innovation driven	3	3	3	3	3.0	C: Product already available although considered somewhat "sub-standard" R: Revenue loss in core meat category, but sales opportunity of new category M: Innovation opportunity but farmers likely to resist G: High alignment to Eat well plate but likely farmer backlash

Key: 1= low, 3 = medium, 5 = high ease of implementation



## Strategies for reducing the climate impacts of UK red meat/dairy consumption

### 11.13 Impact Quantification – GWP Impacts by Meat and Dairy Category

<b>Estimated GWP of meat &amp; dairy categories</b>					
<i>Estimated GWP (tonnes CO<sub>2</sub> e)</i>					
<i>(1 tonne)</i>	<b>1990</b>	<b>2008</b>	<b>2020</b>	<b>2050</b>	
<b>Beef &amp; veal</b>	13.03	13.0	12.97	12.97	
<b>Sheep meat</b>	13.08	13.0	12.94	12.94	
<b>Pig meat</b>	4.4	3.9	3.56	3.56	
<b>Poultry</b>	3.22	2.7	2.26	2.26	
<b>Milk</b>	1.14	1.0	0.94	0.94	

Note: 1 tonne of liquid milk is equated to 1,000 litres (1 cubic metre)

Sources:

Defra (2008). *A study of the scope for the application of research in animal genomics and breeding to reduce nitrogen and methane emissions from livestock based food chains.*

Defra (forthcoming publication). *Developing and delivering environmental Life-Cycle Assessment (LCA) of agricultural systems (IS0222).* Obtained by personal communication.



# Strategies for reducing red meat and dairy consumption in the UK

## 11.14 Impact Quantification - UK Meat and Dairy Consumption Forecasts 2008 - 2050

(millions) source: see note (2) below for further details

Population 2008: 61.4  
 Population 2020: 66.3  
 Population 2050: 80.3

Note: 1 Tonne = 1,000,000g

Consumption (tonnes)	1990	2007	CAGR 1990-2007	2008 (extrapolated)	2020 (extrapolated)	2050 (extrapolated)	2008 per capita (g)	2020 per capita (g)	2050 per capita (g)	Data source reference
<b>Reference data:</b>										
Beef & veal	997,000	1,114,000	0.65%	1,121,295	1,212,653	1,474,951	18,262,134	18,290,386	18,368,009	1
Mutton & lamb	429,000	383,000	-0.66%	380,453	351,181	287,477	6,196,306	5,296,841	3,580,042	1
Milk & dairy products	14,751,000	13,448,000	-0.54%	13,375,041	12,529,803	10,643,072	217,834,546	188,986,467	132,541,372	2
<b>Direct (meat) substitutes</b>										
Poultry	1,208,000	1,798,000	2.37%	1,840,559	2,437,091	4,916,733	29,976,538	36,758,541	61,229,555	1
Pork & bacon	1,202,000	1,370,000	0.77%	1,380,584	1,514,147	1,907,357	22,485,074	22,837,820	23,752,883	1
Edible offal	240,000	170,000	-2.01%	166,586	130,594	71,062	2,713,132	1,969,751	884,958	3

### Notes:

- 1) The estimated consumption levels for the years 2008, 2020 and 2050 are derived by extending of the compound growth witnessed between 1990 and 2007 for the respective commodities.
- 2) UK population is estimated to grow from 60.6m in 2006 to 71.1m in 2031 according to the Office of National Statistics. The compound annual growth rate therefore equates to 0.64% over the period. This compound growth rate is used to estimate population in 2009, 2030 and 2050. Source: <http://www.statistics.gov.uk/cci/nugget.asp?id=1352>

### Sources (by reference number):

- 1) Meat and Livestock Commission (2008) *Annual Yearbook 2007*.
- 2) Defra (2008) *Agriculture in the UK 2007*.
- 3) Murphy-Bokern (2008) *An assessment of the environmental impacts of UK food consumption*.





# Strategies for reducing red meat and dairy consumption in the UK

## 11.15 Impact Quantification - GHG Emissions from Dairy and Red Meat Life-cycle

Estimating the full life-cycle GHG emissions of meat & dairy

	Share of total UK GHG emissions by food consumption-related processes (1)	Share of all-foods consumption-related emissions by process	(Adjusted) share of meat & dairy consumption-related emissions by process (%) (2)
<b>Agriculture (including fertiliser manufacture)</b>	8.5%	45%	68.0
<b>Food manufacturing</b>	2.3%	12%	7.0
<b>Packaging</b>	1.3%	7%	4.0
<b>Transport</b>	2.3%	12%	7.0
<b>Home food related</b>	1.8%	9%	5.5
<b>Retail</b>	1.3%	7%	3.9
<b>Catering</b>	1.2%	6%	3.7
<b>Waste disposal</b>	0.3%	2%	0.9
<b>Total</b>	19.0%	100%	100

Implications on GWP impact for each commodity

	Full life cycle GWP 1990 (tonnes CO2 e)	Full life cycle GWP 2008 (tonnes CO2 e)	Full life cycle GWP 2020 (tonnes CO2 e)	Full life cycle GWP 2050 (tonnes CO2 e)
<i>(1 tonne)</i>				
<b>Beef &amp; veal</b>	19.16	19.12	19.08	19.08
<b>Sheep meat</b>	19.24	19.12	19.03	19.03
<b>Pig meat</b>	6.47	5.74	5.24	5.24
<b>Poultry</b>	4.74	3.97	3.32	3.32
<b>Milk</b>	1.68	1.47	1.38	1.38

Full life-cycle GHG emissions from meat and dairy - 1990 base-levels and a 'business-as-usual' scenario

	1990 Full life cycle emissions (tonnes CO2e)	2008 Full life cycle emissions (tonnes CO2e)	2020 Full life cycle emissions (tonnes CO2e)	2050 Full life cycle emissions (tonnes CO2e)
<b>Agriculture (including fertiliser manufacture)</b>	35,422,724	32,901,812	32,054,335	32,858,600
<b>Food manufacturing</b>	3,646,457	3,386,951	3,299,711	3,382,503
<b>Packaging</b>	2,083,690	1,935,401	1,885,549	1,932,859
<b>Transport</b>	3,646,457	3,386,951	3,299,711	3,382,503
<b>Home food related</b>	2,865,073	2,661,176	2,592,630	2,657,681
<b>Retail</b>	2,031,597	1,887,016	1,838,410	1,884,537
<b>Catering</b>	1,927,413	1,790,246	1,744,133	1,787,894
<b>Waste disposal</b>	468,830	435,465	424,249	434,893
<b>Total</b>	52,092,241	48,385,017	47,138,728	48,321,470

Full life-cycle GHG emissions from meat and dairy - 1990 base-levels and the One Planet Food targets

	1990 Full life cycle emissions (tonnes CO2e)	2020 Full life cycle emissions target (tonnes CO2e)	2050 Full life cycle emissions target (tonnes CO2e)
<b>Total</b>	52,092,241	39,069,180	15,627,672
<b>Induced target reduction</b>		8,069,547	32,693,798

Sources:

- (1) Garnett, T. (2008) Cooking up a Storm.
- (2) Aumonier, S. (2008) Carbon Footprinting - The Science, Challenges and Benefits.



# Strategies for reducing red meat and dairy consumption in the UK

## 11.16 Impact Quantification – Supply Chain Potential Reduction

	<b>2008 Full life cycle emissions (tonnes CO2e)</b>	<b>Estimated improvement by 2020</b>	<b>Estimated improvement by 2050</b>	<b>Estimated full life cycle emissions by 2020 (tonnes CO2e)</b>	<b>Estimated full life cycle emissions in 2050 (tonnes CO2e)</b>	<b>Estimated net change in full life cycle emissions by 2020 (tonnes CO2e)</b>
<i>Agriculture (including fertiliser manufacture)</i>	32,901,812	25%	50%	24,676,359	16,450,906	- 8,225,453
<i>Food manufacturing</i>	3,386,951	<b>5%</b>	80%	3,217,604	677,390	- 169,348
<i>Packaging</i>	1,935,401	50%	70%	967,700	580,620	- 967,700
<i>Transport</i>	3,386,951	20%	80%	2,709,561	677,390	- 677,390
<i>Home food related</i>	2,661,176	10%	66%	2,395,058	904,800	- 266,118
<i>Retail</i>	1,887,016	50%	100%	943,508	0	- 943,508
<i>Catering</i>	1,790,246	0%	0%	1,790,246	1,790,246	-
<i>Waste disposal</i>	435,465	25%	50%	326,599	217,733	- 108,866
<b>Total</b>	<b>48,385,017</b>			<b>37,026,634</b>	<b>21,299,085</b>	<b>- 11,358,383</b>
				<b>(2020)</b>	<b>(2050)</b>	
			<b>Residual to be met by reduced consumption (tonnes CO2e)</b>	- 2,042,546	5,671,412	



## Strategies for reducing red meat and dairy consumption in the UK

### 11.17 Impact Quantification – Consumption Potential Reduction (gross and net) and Farming Sector Impact

Summary Lever Impact Analysis (CO2e reduction potential)	2008	2020	2050
Dairy dilution - composites	-	162,856	394,489
Dairy portion control - deserts	-	230	556
Dairy dilution - liquids	-	183,357	888,298
Dairy to non dairy switch - cheese	-	9	608
Dairy to non dairy switch - milk	-	490,899	4,297,801
Edible offal uptake	-	271,575	1,610,980
Ready meal reformulation/dilution (beef and lamb)	-	1,146,441	2,277,415
Meat avoiders (beef and lamb) - natural trend	-	596,759	1,345,085
Meat reducers (beef and lamb) - awareness/education driven	-	1,196,020	3,558,470
Add. meat to quorn/meat alternatives switch - innovation driven	-	901,906	3,898,615
<b>Total Gross GWP Avoided</b>	-	<b>4,950,050</b>	<b>18,272,318</b>

GWP Net Impact Analysis			
Total avoided tonnage meat	-	215,465	664,870
Total avoided tonnage dairy	-	837,350	5,581,752
Assumed meat replacement product GWP CO2e t (pork poultry)		4.06	3.86
Dairy GWP	1.47	1.38	1.38
Assumed dairy replacement GWP CO2e t reduction factor		30%	30%
Increased GWP from displacement of meat CO2e t		873,875	2,564,170
Increased GWP from displacement of dairy CO2e t		808,881	5,391,973
<b>Increased GWP from meat and dairy displacement</b>		<b>1,682,755</b>	<b>7,956,143</b>

Farming Sector Impact Analysis			
Expected BAU beef and lamb tonnage	1,501,748	1,563,833	1,762,429
Reduction potential tonnage	-	215,465	664,870
One Planet beef and lamb tonnage	1,501,748	1,348,368	1,097,558
% change		-10%	-27%
Expected BAU dairy tonnage	13,375,041	12,529,803	10,643,072
Reduction potential tonnage	-	837,350	5,581,752
One Planet dairy tonnage	13,375,041	11,692,452	5,061,320
% change		-13%	-62%



## 12. Abbreviations

ACORN	A Classification Of Residential Neighbourhoods
AHDB	Agriculture and Horticulture Development Board
BAU	Business As Usual
BSE	Bovine Spongiform Encephalopathy
CAGR	Compound Annual Growth Rate
CAP	Common Agricultural Policy
CCAs	Climate Change Agreements
CCL	Climate Change Levy
CO <sub>2</sub> e	Carbon Dioxide Equivalent
CRCs	Carbon Reduction Commitments
CSR	Corporate Social Responsibility
DECC	Department for Energy and Climate Change
DEFRA	Department for Environment Food and Rural Affairs
DH	Department of Health
EFFP	English Farming and Food Partnerships
FACE	Farming and the Countryside Education programme
FISS	Food Industry Sustainability Strategy
FSA	Food Standards Agency
FCRN	Food Climate Research Network
FMD	Food and Mouth Disease
GDA	Guidance Daily Allowance
GHGs	Greenhouse Gases
GWP	Global Warming Potential
G PP PW	Grams, Per Person, Per Week
IGD	Institute of Grocery Distribution
KOFs	Key Opinion Formers
PPN (i.e. litres/ppn/year)	Per Person
LEAF	Linking Environment and Farming
LCA	Life Cycle Analysis
M&S	Marks and Spencer
MLC	Meat Livestock Commission
MECE	Mutually Exclusive, Collectively Exhaustive
MT	Mega Tonnes
NDNS	National Diet and Nutrition Survey
NGO	Non-Government Organisation
NHS	National Health Service
ONS	Office for National Statistics
RMIF	Red Meat Industry Forum
RO	Renewables Obligation
RTRS	Round Table for Responsible Soy
SDC	Sustainable Development Commission
UK	United Kingdom
WBCSD	World Business Council for Sustainable Development
WCRF	World Cancer Research Fund
WRAP	Waste and Resources Action Programme
WWF	World Wildlife Fund