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REPORT SUMMARY

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WORKING TOGETHER FOR SUSTAINABLE FOOD

FOOD ETHICS COUNCIL

Conservation | Climate Change | Sustainability

Prime cuts

Valuing the meat we eat

A discussion paper by WWF-UK and the Food Ethics Council

About WWF-UK
WWF is the world's leading independent conservation organisation. We're at the heart of efforts to tackle the most serious conservation challenges facing the planet – to build a future where people and nature thrive together.

Our food programme is a ground-breaking initiative. It's dedicated to achieving a sustainable, equitable and fair food system. Food production and consumption, including deforestation and land-use change for agriculture, are responsible for 30% of the UK's CO2 emissions. It's clear that we must change the way we produce food – and the way we consume it. Since 2009 we've been working with government, retailers and producers to understand and reduce the impacts of food consumption on the environment.

This report is part of a series of discussion and research pieces that explore the challenges of sustainable diets as a means to address the stalemate in debate over the role of meat consumption in mitigating climate change.

For further information on the work of the One Planet Food programme visit our website: wwf.org.uk/food

About Food Ethics Council
The Food Ethics Council is a charity that provides independent advice on the ethics of food and farming. Our aim is to create a food system that is fair and healthy for people and the environment. Our 13 Council members include bioethicists and moral philosophers, farmers and food industry executives, scientists and sociologists, academics and authors.

Find out more about our work, including the members of the Council, our exclusive Business Forum, and our must-read magazine, Food Ethics, on our website at www.foodethicscouncil.org

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Esmée Fairbairn FOUNDATION

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Executive summary

This report is a first step towards defining 'less but better' meat consumption – in an attempt to move the debate beyond the contentious issue of simply encouraging people in the UK to eat less meat. Despite the potential benefits for health and the environment, there is, as yet, no consensus on more active policies to reduce meat consumption. Producers and primary processors raise legitimate concerns about the impact that reducing meat production would have on their businesses, and politicians remain wary of the reaction of both industry and the public.

Yet if we're to address the multiple challenges of climate change, water scarcity, land use change, biodiversity loss, obesity and malnutrition, global poverty and inequalities in a more affluent world of nine billion people by 2050, we have to consider reducing meat consumption in developed countries such as the UK as part of the solution. With rising food and feed prices already impacting on consumers and farmers, business as usual is not an option. So the question is how to move forward, despite these challenges.

During the last few years, WWF-UK and the Food Ethics Council have been working in partnership to facilitate dialogue with livestock producers. Our aim is to break out of the stalemate over the role that changing meat and dairy consumption should play in tackling climate change, as well as exploring the barriers to sustainable food consumption.

It's been proposed that focusing on 'better' meat too, rather than solely on eating less meat, could be a more palatable message – and one that could deliver broader benefits than simply eating less meat. Yet there is no clear understanding, among producers or consumers, of what 'less but better' might mean in practice.

The purpose of the research underpinning this report has been to explore the scope of what 'less but better' meat consumption could mean, to identify potential win-wins and/or trade-offs and evidence gaps, and to make recommendations for next steps. Due to the limited time and resources available, the research excluded dairy consumption and production and meat production that is a secondary product of the dairy and egg industries. We recognise that including these elements would be valuable areas for further research.

This report is intended to provide focus for policy development, engagement and research. Specifically it is intended to provide a useful contribution to Defra's Green Food project. It:

- provides an overview of UK meat consumption and production (p 12)
- summarises the problems associated with high meat consumption (p 15)
- identifies ways in which 'better' meat consumption and production could be defined and identifies win-wins and trade-offs (p 19)
- discusses the findings, identifies gaps in knowledge and research and makes research recommendations (p 32)
- draws conclusions and makes policy recommendations (p 37)

Defining 'better'

We identify nine potential ways (see box) to define 'better' meat consumption and production across a spectrum of outcomes for climate change, the environment, animal welfare, human health, livelihoods, social justice and social values. Our research highlights a number of win-wins between these outcomes. For example, pasture-fed livestock and more extensive production systems offer benefits for health and biodiversity and potentially for animal welfare and producers. Also, reducing waste throughout the system has multiple benefits and is widely supported. A focus

on provenance – whether local, regional or national – presents opportunities for connecting, and providing benefits for, producers and consumers. Reconnecting people to food and farmers may provide access to the changes in attitudes and behaviour that would encourage more considered meat consumption. Furthermore, the higher cost of buying better meat doesn't necessarily need to cost consumers more if it's offset by savings made from buying less.

Defining 'better' meat consumption and production

We've identified, in no particular order of priority, nine potential ways in which 'better' meat consumption and production could be defined across a spectrum of outcomes – including environmental, social, economic and cultural.

1. Better for human health
2. Better for climate change and the environment
3. Better for biodiversity
4. Better for animal welfare
5. Better for farming profitability
6. Better for fairness
7. Better for reducing waste
8. Better for quality and taste
9. Better for reconnecting producers and consumers

We also found trade-offs between definitions. We conclude that it may not be possible to achieve better meat consumption across all definitions at the same time. In particular, defining better meat consumption as having lower impact in terms of greenhouse gas (GHG) emissions in isolation is problematic. For example, more extensive systems such as organic, typically associated with higher levels of animal welfare and environmental stewardship, rear slower growing animals, that during the course of a longer life require more feed energy and produce more methane, increasing their GHG impact. Such judgements are not always clear cut, and are complicated by the need to include the impacts of land-use change for animal feed, nitrous oxide emission, and carbon sequestration through pasture in life cycle assessments.

We also recognise that climate change, environmental and producer benefits from less but better meat consumption are only potential benefits as the relationship between consumption and production is not clear given meat imports (42% of UK consumption) and exports (20% of UK production). Hence reduced UK consumption would not necessarily fully translate into reduced UK production and may have unintended consequences. Neither can we assume that if consumers reduce their consumption they will automatically seek out UK-sourced meat and trade up to 'better' that provides better economic returns for farmers.

Reduced demand through less meat consumption could potentially put downward pressure on prices as the same number of producers chase fewer customers. We raise the idea that the industry could mitigate potential lower UK sales by positioning itself as an exporter of high quality, sustainably produced meat. However, we recognise that unless production and consumption policies are addressed elsewhere in the world, this could be perceived as the UK undermining its responsibilities towards GHG mitigation. The EU's Roadmap to a Resource Efficient Europe and reform of the Common Agricultural Policy potentially offer scope for a coordinated approach to sustainable consumption and production policies, including economic incentives for

more environmentally sustainable and higher welfare farming models that could accompany reduced consumption.

The most important aspect of 'better' may be that in eating meat we recognise it as a valuable resource. By recognising meat as a high quality food, we are encouraged to acknowledge and respect the animals that provided it, the farmers that produced it and those in the supply chain that prepared and delivered it; and in recognising its value, we will be less inclined to waste it.

Next steps for policy

Despite these complexities, we conclude that there's compelling evidence for UK governments and the industry to acknowledge the importance of reduced meat consumption as part of healthy, sustainable diets. And for them to commit to explore further a 'less but better' approach. We welcome the recognition of the importance of sustainable food consumption within the next steps of the Green Food partnership project[1] and the intention to facilitate a 'wider and more sophisticated debate across the whole food chain about the role diet and consumption play in the sustainability of the food system'.

We specifically recommend that the next steps for Defra and its partners in the Green Food project include work to:

- **define sustainable diets, including the role for less but better meat consumption;**
- **convene a symposium to engage a wide range of stakeholders to explore the issues raised by this report;**
- **explore mechanisms and policies that would support transition to less but better meat consumption and production;**
- **engage all players throughout the food chain and develop actions for producers, processors, retailers, consumer organisations, civil society organisations and policy makers together; and**
- **actively engage with EU policy processes to support the transition towards sustainable food consumption and production.**

Evidence gaps

While this must not be an excuse for inaction, our research identified a number of gaps in knowledge. We make a number of recommendations to address these.

Life cycle assessment challenges

Our research highlights the ongoing challenges around measuring and comparing GHG impacts as they relate to livestock production. While a full critique of life cycle assessment methodology for livestock production was outside the scope of this report, it's clear that there's still uncertainty and some controversy in the scientific evidence base particularly around carbon sequestration through pasture, as well as the more general issue of comparability between studies since many different assumptions and methods are used.

We recommend that better comparability of data and consensus on methodology of life cycle assessment studies relevant to livestock production is essential to underpin understanding and decision-making. Specifically we recommend work to agree that the impacts of land-use change from animal feed and carbon sequestration through pasture are included in life cycle assessments.

Consumer perspectives

Another significant gap in knowledge is the understanding of how different

consumers would perceive and react to messages about moving towards 'less but better' behaviour change.

We recommend research to:

- **understand how consumers define 'better' meat consumption in the context of a less but better message;**
- **understand the opportunities for and the barriers to less but better meat consumption, for consumers;**
- **understand whether a less but better message is more likely to produce reductions in meat consumption than a simple 'less' message;**
- **identify market segmentation of consumers in relation to less but better meat consumption;**
- **model new consumption patterns for different income groups; and**
- **identify policies and practices by governments and the food chain to help consumers make the transition to less but better meat consumption.**

A specific gap in evidence identified by this research relates to how less but better meat consumption applies to consumers on low incomes.

We recommend research to:

- **involve different households experiencing low income in elaborating what policies and practices would enable less but better meat consumption in low-income households;**
- **include retail and producer insights into low-income consumer practices and how these might shift under different policy scenarios; and**
- **analyse policy initiatives and practices, across sectors, to ensure these don't exacerbate inequalities in diet and health in pursuit of less but better meat consumption as part of sustainable diets.**

Producer perspective

We recognise that this research is a first step towards understanding what less but better meat consumption could mean in practice and applying this to the different livestock sectors has been beyond the scope of our research. We therefore recommend that the bodies supporting the different livestock sectors undertake work to:

- **more fully evaluate the nine definitions of 'better' identified here, in respect of their sectors.**
- **identify priority definitions for environmental, social and economic sustainability**
- **identify the incentives that would support market transition towards these win-wins.**

Market mechanisms

We recommend further exploration of the market mechanisms that would support less but better meat consumption and production and help livestock farmers to diversify and support transition to less but better production. We recognise that strategies that can offer economic opportunities are more likely to secure policy and industry engagement. We recommend that further work would help to understand where the greatest opportunities lie within the marketplace to establish the best focus for policies and practices.

We recommend research to understand:

- **the market mechanisms and policies that would support livestock farmers to diversify and support the transition to less but better production;**
- **the policies and mechanism that could prevent producers of better meat from being undercut by less sustainable, lower quality meat and meat products either imported or domestically produced; and**
- **how impacts of increased feed and energy costs on producers provide an opportunity to move towards less but better production.**

1. Introduction

'There is still no international agreement on the details of a sustainable diet, but most experts agree that consumers in developed countries should reduce their relative consumption of meat and dairy products and proportionately increase their consumption of vegetables and fruit products.' UNEP, 2012[2].

If we are to address the multiple challenges of climate change, water restraints, land-use change, biodiversity loss, obesity and malnutrition, global poverty and inequalities in a more affluent world of nine billion people by 2050, we have to consider the issue of meat consumption as part of the solutions. Technical approaches to 'efficiency', to reduce the GHG impacts of livestock production – the major UK policy and farming industry focus to date – will not be sufficient alone. And, as we explore in this report, such approaches are likely to have adverse consequences for other important outcomes for the environment and animal welfare.

Research by WWF and others has established the high ecological footprint associated with western levels of consumption, which require greater volumes of natural resources than the planet can sustainably provide[3]. The consumption of meat forms a significant component of that footprint. European consumption levels are twice the world average[4].

From a climate change perspective, evidence suggests that technical approaches to reducing the impacts of meat production will not by themselves be successful in preventing significant climate impact[5]. As a result, changes in consumption behaviour are important. And given the significant contribution of high impact foods – notably meat [1] – to climate change, there's a strong argument for reducing such consumption as part of the transition towards sustainable diets.

Yet despite the evidence that reducing meat consumption could potentially deliver benefits for climate change, public health, the environment and animal welfare, while also reducing pressures on land use and upward food prices, reducing meat consumption is a contentious issue and as yet there's no consensus on more active policies to discourage meat consumption within the UK.

Actively advocating reduced meat consumption remains a controversial and even emotive subject for politicians, producers and much of the public[6]. It sits uncomfortably with broader government policy to avoid perceptions of 'the nanny state' and raises concerns that reduced consumption risks harming UK food production interests[7]. Producers and primary processors raise legitimate concerns about the impacts that reducing meat production would have on their businesses[8], and politicians remain wary of both producer and public reactions[9].

Nonetheless a growing body of evidence – including the government's 2011 Foresight report on food security – recognises that "more proactive measures affecting the demand and production of meat might be needed in the future"[10]. Hence the seriousness of the challenges faced, which are recognised by all stakeholders, make strategies to reduce meat consumption an important topic for consideration.

The next steps for the current Green Food partnership project[11] between the government and stakeholders, recognises the importance of sustainable food consumption. Defra is working with the project's partners "to facilitate a wider, more sophisticated debate across the whole food chain about the role diet and consumption play in the sustainability of the food system". Specifically a working group on sustainable consumption is looking at:

i) Principles of a healthy and sustainable diet – mapping out a set of principles or characteristics of a sustainable diet, and understanding what information is available to consumers.
ii) Consumer behaviour – looking for clarity on what's well understood about consumers' behaviours relating to diet and sustainable food and what isn't, with a view to identifying where priorities lie for further investigation/follow-up action.
iii) Sustainable consumption and growth – exploring the different ways that sustainable consumption and growth can work positively together.

Less but better

The term 'less but better' has been coined to describe a way of consuming reduced quantities of meat, in a way that has the potential to deliver reductions in environmental impact while at the same time potentially providing additional benefits to consumers, producers and animal welfare. 'Less but better' is seen as a more palatable message, suggesting that although consumers are being asked to do something they may not necessarily want to do (reduce their meat consumption) they are offered a trade-off that their remaining meat consumption will be a better quality product but should not cost them more overall.

Yet there's no shared understanding of what 'less but better' meat consumption might mean in practice. EBLEX, the organisation for beef and lamb levy payers in England, has highlighted the need to define 'less but better quality meat'.[12]

The research on which this report is based aimed to map the scope of the concept of 'less but better' meat consumption and specifically to consider:

- How 'better' meat consumption could be defined – including the benefits for the environment, health, animal welfare, producers and consumers.
- Where the win-wins and trade-offs are.
- Where the gaps in knowledge and research are.

This current research and report forms part of Livestock Dialogues[13], a partnership project between WWF-UK and the Food Ethics Council (FEC), funded by Esmée Fairbairn Foundation to explore the barriers to sustainable food consumption. This has included examining the role that government and retailers could play.

The Livestock Dialogues project builds on previous work by WWF-UK and FEC to facilitate a series of dialogues with livestock producers and other key stakeholders to break out of the stalemate over the role that changing meat and dairy consumption should play in tackling climate change.[14] This showed a cautious acceptance among producer organisations that diets which reduce GHG emissions are not automatically a threat to profitability, including diets containing less meat. It also called for clarification of 'less but better' meat and dairy.

Research approach

FEC commissioned Chris Sutton to undertake 15 days of research to address these questions. The geographical scope of the research focuses on UK consumption though it recognises UK consumption is built on production in the UK and internationally and therefore includes reference to relevant global issues.

Due to the limited time and resources available, the research excluded dairy consumption and production and meat production that is a secondary product of the dairy and egg industries. We recognise that including these elements would be valuable areas for further research.

The researcher was advised by a small group of experts (see appendix) to guide the research and to help understand different perspectives on the research questions. Perspectives were sought from academics with expertise in climate change, animal welfare, organic farming systems and public health. Additionally the researcher met with representatives from stakeholder organisations including EBLEX, the National Farmers Union and Defra, the UK government Department for the Environment Food and Rural Affairs, to understand their perspective on the prospects for 'less but better' meat consumption.

Information and relevant literature sources provided by the advisory group were supplemented by additional targeted web searches for academic and grey literature and by following up on relevant citations from literature suggested by the advisory panel. Given the breadth of the research brief and the limited duration of the research, no full review of the literature was possible. While this was somewhat mitigated by advice from the advisory panel members on where best to focus, the extent to which this research can identify gaps in the research is limited and reliant to some extent on the conclusions drawn by other researchers.

This report:

- provides an overview of UK meat consumption and production (p 12)
- summarises the problems associated with high meat consumption (p 15)
- identifies ways in which 'better' meat consumption and production could be defined, as well as identifying win-wins and trade-offs (p 20)
- discusses the findings, identifies gaps in knowledge and research, and makes research recommendations (p 32)
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The report is intended to provide focus for policy development, engagement and research. Specifically it is intended to provide a useful contribution to Defra's Green Food partnership project.

2. Overview of UK meat consumption and production

In order to consider how 'better' meat consumption might be defined in the UK, it is important to have an understanding of what constitutes domestic meat consumption. The UK population currently consumes nearly 5 million tonnes of meat per year. Poultry (mainly chicken) is the most consumed meat, followed by pig meat, then beef and veal, with lamb and mutton constituting a relatively small share.

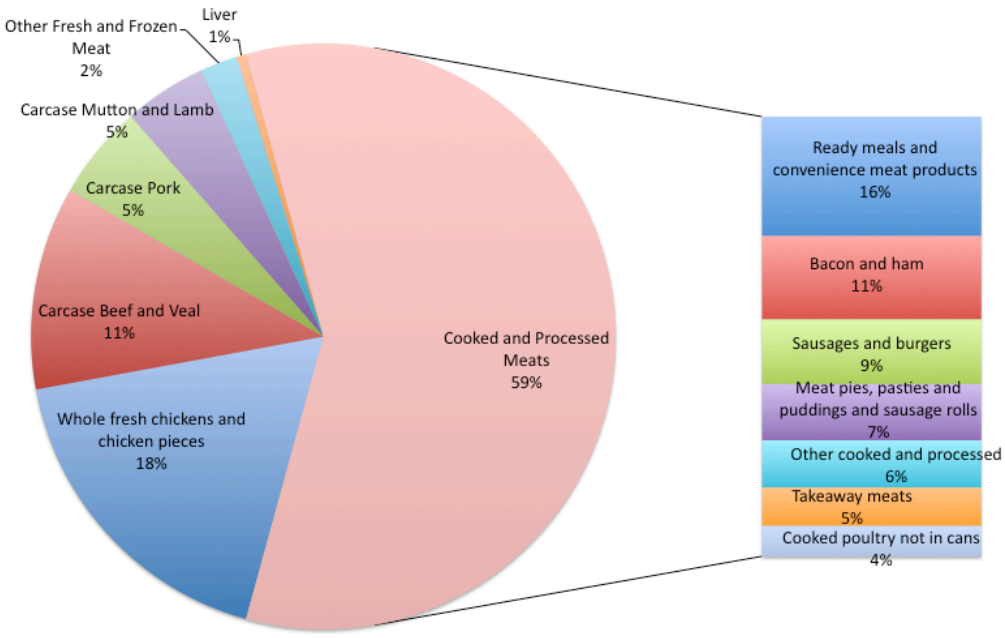
- 40% (1.9 million tonnes) of poultry, mainly chicken
- 31% (1.5 million tonnes) of pig meat
- 23% (1.1 million tonnes) of beef and veal
- 6% (0.3 million tonnes) of lamb and mutton
  EBLEX, 2011[15].

It is estimated that over 80% of meat consumed (by volume) is purchased from retail outlets for household consumption, with 20% supplied by the food service sector[16].

Figure 1 illustrates the proportion of different meat products purchased for household consumption, based on Defra's Family Food data collected as part of the Office for National Statistics annual Living Costs and Food Survey in 2010[17]. This includes takeaway meals in household consumption but excludes other 'eating out' food purchases[18]. The data records average quantities of food items purchased by a household in a week.

Looking only at meat-related product categories, it's possible to estimate the proportion of different meat products that constitute average household purchases. This indicates that over half the meat-based products that are consumed in the home have been cooked or processed in some way before purchase. And that the fresh cuts of meat may form only a minority of the meat we consume. Because some meat-based products such as ready meals and pies include ingredients other than meat, it is only indicative of the proportions of actual meat consumed. Nevertheless the information provided is useful in illustrating our food consumption habits.

Figure 1: Proportion of household purchases of meat and meat products by quantity [19]



The Defra data series of household food and drink purchases dating back to 1974 indicates that the overall quantity of household UK meat purchases has remained reasonably constant. However, as consumption of meat across Europe has increased by 80% since the early 1960s it's likely that there has been a significant rise in consumption of meat outside the home over this time period[20].

Consumption of specific types of meat and meat products has also changed considerably over time. Since the 1960s there has been a decline in the amount of carcase beef and lamb purchased, and very significant increases in chicken and ready meals[21]. Takeaway food consumption has also increased four-fold since the mid-1970s, though this has fallen back slightly in recent years.

UK demand for meat is met by a combination of domestic production and imports. Theoretically, current levels of UK production could meet 71% of domestic demand. However, because a proportion of domestic production is destined for export markets, imports account for over 40% of the amount of meat consumed[22] (see Table 1 below). The UK is particularly reliant on imports for pig meat, with 58% of 2009 demand being met from imports[23].

The origin of meat coming into the UK varies according to species and whether the meat is fresh/frozen or processed. Most fresh/frozen and processed beef imports come from within the European Union, primarily from the Irish Republic, although corned beef is primarily imported from Brazil[24]. Nearly 90% of sheep meat is imported from outside the EU, primarily from New Zealand[25]. The origin of imported pig meat is primarily Denmark and the Netherlands although other European countries including Belgium, Germany, Ireland and France are significant suppliers[26]. Most fresh/frozen chicken meat is imported from within in the EU, however over half of processed chicken meat originates in Thailand[27].

Table 1: UK consumption, production, imports and exports (adapted from EBLEX, 2011[28])

All figures in millions of tonnes

	Poultry	Pig meat	Beef and veal	Lamb	Total
UK consumption	1.9	1.5	1.1	0.3	4.8
UK production	1.5	0.8	0.9	0.27	3.5
UK exports	0.27	0.19	0.13	0.09	0.69
UK imports	0.65	0.88	0.40	0.12	2.06
Imports as % of domestic demand	34%	58%	33%	39%	42%

UK total meat consumption per capita is around average for EU member countries, at just over 50kg per capita per year[29]. More recent member states from central Europe tend to consume less than the average, while some countries including Spain, Cyprus, Austria and Denmark consume significantly more. There are significant differences in consumption habits between states, with UK consumers eating significantly less

pig meat and significantly more chicken than average[30]. Compared to the global average, UK meat consumption is high – approximately twice the world average[31].

Understanding patterns of UK consumption and production is essential in order to evaluate strategies for 'better' meat consumption. As a very significant amount of UK consumption is met by imports, it is important that this foreign trade dimension is considered when assessing the impact of any consumption-based policies.

3. Why is meat consumption an issue?

The global challenges presented by meat and livestock production and consumption have been written about extensively[32]. Growing global demand for meat will only exacerbate these challenges.

This section briefly outlines the multiple challenges associated with high meat consumption – focusing on health, climate change, the environment and animal welfare. These issues are complex and form part of even broader questions about how we move towards a global food system that meets human needs within environmental limits, in a way that contributes to human wellbeing (providing livelihoods and income) and is respectful of farmed animals.

Predicted trends in global population growth, consumption habits and resource availability create further challenges. As the populations of developing countries become wealthier, those with newly-increased incomes choose to eat diets with higher proportions of fats, sugars and animal products – a trend that's become known as the nutrition transition[33]. For example, between 1980 and 2005 consumption of meat per person in China has quadrupled, while in Brazil it has doubled[34]. Coupled with absolute increases in global population that will increase demand for food generally, the rising demand for meat that accompanies increased wealth will add to the environmental impacts outlined below such that the environmental impact of meat production would need to be halved by 2050 to maintain the same level of damage[35].

Increased meat production will put pressure on both land and water, the scarce resources needed to produce it. Increasing demand for meat, coupled with limited agricultural land on which to grow crops for human or animal consumption, will continue to drive world food and feed crop prices upwards[36]. This adds to other pressures on food prices, including the use of agricultural land to produce biofuels and biomass, and volatility that may be caused by the financialisation of food commodity markets[37].

With one third of the world's arable land being used to produce animal feed for intensively-reared livestock that generate less edible protein than the feed crops themselves, meat and livestock is at the heart of the food security debate – about how best to meet the world's food needs[38].

As Western levels of meat consumption per person are far higher than those of developing countries, it seems sensible that those consuming the greatest amount of meat reduce their consumption to allow others with far less to consume more. However, as developing countries are more populous than developed countries, moderation of meat consumption may also be necessary in countries with much lower per capita meat consumption levels in order to mitigate the threat of climate change[39].

3.1 Human health

While meat is not an essential component of human diets, it is a source of dietary nutrients including protein, iron, zinc and B vitamins. In the UK protein deficiency is not a nutritional problem: average protein intakes of 78g/day are well above recommended levels of 50g/day[40]. The World Health Organisation (WHO) is among many organisations which suggest that in the West we now consume considerably more protein than is considered necessary or optimal for health[41]. Meat also provides iron and zinc. While persistent deficiency in iron intake can lead to anaemia, with children and young women most at risk[42], the government's Scientific Advisory

Committee on Nutrition found that reductions in meat consumption to 70g/day would be likely to have little impact on nutrient deficiency[43].

High levels of consumption of red meat and processed meat products[44] have been found to be detrimental to public health, and to be associated with risks to health including cardiovascular disease (CVD), stroke, diabetes and colorectal cancer. This has led to recommendations that consumption should be moderated. Recent large meta-analyses[45] found significant increases in the risk of coronary heart disease (CHD), type 2 diabetes and colorectal cancer with increased intake of processed meat. A significant increase in colorectal cancer risk has also been shown with increased intake of red meat.

New modelling research[46] found that there would be significant health as well as environmental benefits if the UK population adopted a low red and processed meat dietary pattern. Modelling by Oxford University also shows that switching to diets that contain less meat could reduce deaths from heart disease by 31,000, deaths from cancer by 9,000 and deaths from strokes by 5,000 each year. Furthermore, preventing these 45,000 early deaths would save the NHS £1.2bn each year.[47]

The World Cancer Research Fund/American Institute for Cancer Research recommends that individuals consume less than 500g red meat/week and avoid processed meats. The government's Scientific Advisory Committee on Nutrition recommends no more than 70g/day of red meat[48]. Currently 58% of men and 23% of women exceed the 70g/day red meat targets[49]. Advice is to replace reduced meat consumption with increased consumption of plant-based foods.

The way in which animals are bred and reared is a factor in the nutritional profile of their meat. For example, pasture-reared beef contains less fat and has a higher proportion of healthy omega-3 fatty acids compared with intensively reared predominantly grain-fed beef[50]. A typical supermarket chicken today contains 2.7 times as much fat as it did in 1970, and 30% less protein[51].

Other implications for human health from meat production and consumption include threats to human health caused by the environmental impacts outlined below, from animal pathogens and transboundary diseases to food-borne illnesses caused by poor levels of food hygiene[52]. Also a major concern is the impact of routine prophylactic use of antibiotics, particularly in pig and poultry production, on human antibiotic resistance[53].

3.2 Climate change

Food and drink have been estimated to account for up to one third of total GHG emissions attributable to the UK consumers (when contributions from land-use change for agriculture are included).[54] While estimates of the exact impact vary there is consensus that livestock-based products are more intensive producers of GHG emissions than other food groups and contribute up to 30% of global GHG emissions[55]. Ruminant meat production (beef and lamb) produces the greatest GHG impact, followed by non-ruminant meat (pork and chicken)[56].

Livestock production impacts on GHG emissions directly in terms of direct emissions from the production process, and indirectly as a driver of land-use change. Direct emissions come in the form of methane (CH_4) released by livestock, nitrous oxide (N_2O) from nitrogenous fertiliser and other inputs applied to feed crops or grazing land, and less significantly carbon dioxide (CO_2) from the use of fossil fuels. Methane is released by all livestock in their manure, but is particularly significant with ruminating cattle and sheep that exhale methane during the digestion process[57].

Based solely on direct emissions up to the farm gate it is estimated that livestock products account for around 8% of GHG emissions within the UK[58].

Indirect GHG emissions are primarily the result of livestock production and animal feed cultivation being drivers of land-use change. This occurs when land is converted from natural grassland or forest to agricultural use. Of particular concern has been land-use change in South America, driven by demand for soya crops. Soya is a common ingredient in concentrated animal feeds because of its high protein content.

Quantifying livestock's impact on land-use change is very difficult and is often not included in estimates of livestock climate change impact. For example, it is excluded from the 8% figure estimated as livestock's share of UK GHG emissions[59]. Given the significance of deforestation as a cause of climate change and agriculture as a driver of deforestation, WWF and the Food Climate Research Network (FCRN) estimate that land-use change accounts for as much as 40% of the emissions driven by UK food consumption[60].

The impact of livestock on climate change as a result of land-use change is also complicated by the positive role that permanent pasture for grazing plays in storing carbon. The extent of the beneficial effect that ruminant livestock grazing can provide is debated[61].

To meet the target of reducing emissions by 80% by 2050, the government's Committee on Climate Change proposes changes in consumption towards foods that are less emissions-intensive[62].

3.3 Other environmental impacts

As well as being a significant cause of climate change, livestock production can cause a number of other environmental impacts both directly from animal rearing and indirectly from the crops grown to feed livestock. Globally, livestock production accounts for 70% of all agricultural land and 30% of the land surface of the planet[63]. Meat's production is typically highly water, grain and land intensive, with one third or more of the world's cereal harvest and over 80% of soya used for animal feed[64]. Animal feed production, such as soya for protein, is a significant driver of the loss of high value habitats as well as land-use climate change emissions.[65]

Environmental impacts from livestock production include pollution from excess nitrogen and phosphorus (causing eutrophication by run-off into rivers, lakes and seas), heavy metals used in feed supplements, pathogens and veterinary medicines[66]. Additionally, overgrazing of livestock is associated with degradation of soils through erosion and soil compaction[67].

The use of artificial nitrogen fertilisers has enabled increased production of crops for animal and human consumption, but has led to serious environmental issues as excess nitrogen is released in reactive forms such as nitrates and ammonia as well as N_2O. The European Nitrate Assessment identifies five key threats of excess nitrogen – to water, soil and air quality, greenhouse balance and ecosystems[68]. As nitrogen recovery is lower for animals than crops, meat production leads to greater losses of nitrogen into the environment than crops[69]. Within the UK, livestock production is estimated to be responsible for 60% of nitrate pollution and 25% of phosphorus pollution of waterways[70]. An EU Nitrates Directive aimed at reducing agricultural water nitrate pollution has had mixed success with reductions in pollution overall, but with some areas seeing increased nitrate levels[71].

As well as impacting on water quality, livestock production has a significant effect on

water depletion. Globally, large amounts of water are required for consumption by animals and for irrigating feed crops. Service water is also required in farming operations, while slaughter operations use significant amounts of water in washing and rinsing[72]. In the UK, significant levels of rainfall may mitigate the potential impacts of livestock production on water resources (at least for ruminants consuming domestic graze and forage). EBLEX research into the impact of livestock production on water resources shows that the majority of water embedded in English ruminant livestock production was 'green' water, i.e. rainwater unavailable for other uses as opposed to 'blue' water abstracted from rivers, lakes or groundwater sources[73].

The environmental impacts outlined above have a negative impact on biodiversity. The UK 2011 National Ecosystem Assessment described a general trend over the past 60 years of increased crop and livestock production being accompanied by "a loss of landscape diversity, an increase in soil erosion and reduced soil quality, and a reduction in farmland birds and pollinators, in particular"[74].

However, alongside this loss of diversity it should be recognised that grazing can also have a positive impact in shaping and maintaining biodiversity and a variety of grassland habitats[75]. In some circumstances, livestock is an important conservation tool in managing semi-natural habitats such as plant and wildlife-rich meadows and pastures.

Pressure to convert natural grasslands for animal feed production can also have a very serious impact on biodiversity. Specifically, the conversion of large parts of the Brazilian Cerrado into agricultural land for soya feed production presents a major threat. Of more than 11,000 vascular plant species found in the Cerrado, over half are unique to the area[76].

The diminishing biodiversity among farmed animals themselves also raises concerns for resilience and disease control. Relying on fewer specialised breeds means animal diseases can spread rapidly through genetically similar animals. The State of the World's Animal Genetic Resources for Food and Agriculture[77] describes the link between livestock biodiversity and food security.

3.4 Animal welfare

Less meat consumption, resulting in less meat production, would mean a reduction in the number of animals reared and potentially fewer pressures to intensify production. However, it is also argued that it could concentrate production in the hands of the most intensive and efficient operators.

Increased production of meat has been accompanied by the adoption of increasingly intensive production methods, particularly for pigs and poultry. Intensive animal production systems include the selection of animals for rapid growth, leading to lameness and other physiological disorders and the use of cages and crates or overcrowded conditions that severely restrict animal behaviour[78].

The Farm Animal Welfare Forum has identified improvement in broiler chicken and pig welfare as priority issues. Stocking densities and health issues caused by very fast growing breeds are seen as key areas for improving the lot of the five billion broiler chickens bred for meat in the EU each year, while the stressful environments of intensive pig rearing that have led to routine tail docking are also targeted[79] (FAWF, 2010).

There is continuing debate as to whether large scale production is necessarily incompatible with good animal welfare. Some commentators suggest that modern

production facilities can provide high standards of husbandry and animal welfare, for example by being large enough to employ specialist staff and vets. Conversely, it is argued that the lack of natural/outdoor space and animals bred for rapid growth and high production are incompatible with high standards of animal welfare.

4. Defining 'better' meat consumption and production

In this section we seek to identify the range of ways in which meat consumption and production could be described as 'better' across a number of outcomes for the environment, climate change, public health, animal welfare, producer livelihoods, society and consumers. We explore ways in which 'less but better' meat consumption and production could potentially deliver even more positive results, mitigate the effects of some trade-offs and provide a more palatable message for producers, the public and politicians.

4.1 Better for health

Health is the top reason given by people cutting back on red meat consumption according to market research company, Mintel, with 15% of UK consumers saying they avoid red meat.[80]

The evidence cited in section 3.1 points to health benefits from reduced meat consumption – particularly for those individuals who are high consumers of red meat and for consumers of processed meat products. A reduction in processed meats on its own seems desirable. For other meats, the most positive health impact is from replacing some meat consumption with additional fruit and vegetables, which are known to be important for good health[81].

'Better' from a nutritional perspective includes choices of meat and meat products that reduce consumption of total fat, saturated fat and salt, and which lead to increased consumption of health-promoting nutrients. This is likely to be achieved through changes away from lower value processed meats, though, as discussed below (see 4.7 Better for waste) this may have knock-on impacts within the supply chain if producers find it more difficult to balance carcass usage.

There is also some evidence for additional benefits relating to the nutrition profile of meat depending on the type of production system. Better could refer to meat from pasture-fed animals as research suggests that a number of beneficial nutritional components may occur at higher levels in grass-fed compared to cereal-fed animals[82].

Of most significance are overall fat levels and levels of long chain omega-3 polyunsaturated fatty acids, which are important for brain and heart health. Modern diets are often deficient in omega-3 fatty acids and have excessive amounts of omega-6 fatty acids relative to omega-3. Pasture-reared beef has been found to contain between 25% and 50% less total fat than intensively-reared beef and to have a higher proportion of omega-3 fatty acids and a more favourable (lower) ratio of omega-6 to omega-3 fatty acids, compared with intensively-reared, primarily cereal-fed beef.[83]

Pasture-reared lamb also has a higher proportion of omega-3 fatty acids and a more favourable (lower) ratio of omega-6 to omega-3 fatty acids compared with intensively-reared lamb.

For chicken production, both the rearing system and the breed significantly influence the fat content of chicken meat. Free-range and organic chicken meat often contains less fat than intensively reared chicken meat, in some cases as much as 50% less. Meat from slower-growing chicken breeds also contains less fat than fast-growing breeds. Free-range and organic chicken meat generally has a higher proportion of omega-3 fatty acids compared with intensively reared chicken meat. Thus there are win-wins for both health and animal welfare in free-range and/or organic production methods.

4.2 Better for climate change and the environment

A large amount of literature exists on the environmental impact of livestock farming and technical solutions to reduce its impact on climate change[84]. Technical approaches imply that better meat consumption involves eating meat that has a lower climate change impact per unit of meat produced. This is currently the dominant perspective for addressing climate change impacts in the livestock sector and among policy makers. Serious efforts are being made to make sure production processes use resources more efficiently, which is also seen as having a positive economic benefit for producers[85].

The EBLEX roadmap identified that the main opportunities for increasing efficiency in the meat and livestock sector are improving the feed efficiency of slaughter stock and increasing the longevity and fertility of breeding stock[86]. Maximising feed conversion reduces the amount of feed required to produce a unit of meat. It therefore also reduces the climate impact associated with producing that feed. Improving the fertility and longevity of breeding stock spreads their cost and climate impact over a higher quantity of meat produced. As well as seeking to achieve an animal's finishing weight as early as possible, EBLEX characterises low-carbon farms as having reduced reliance on artificial fertiliser, and using feed with lower-carbon protein sources to reduce the use of soya within feed rations, owing to the impacts of land-use change driven by demand for soya crops[87].

In addition to the work done by EBLEX, soya use has also been reduced in the pig sector, although it remains an important source of protein in livestock, favoured for enabling more efficient meat production[88]. Soya's unique high protein content makes it a cost-efficient feedstuff, and its usage is unlikely to reduce significantly in pig and poultry production in the foreseeable future. To mitigate the potential impacts of soya production a number of certification schemes have defined a set of standards for soya production, including criteria on land-use conversion for new crop expansion to stop deforestation, and applying principles of good agricultural practice.

In 2007 one of these schemes, the Round Table on Responsible Soy (RTRS) was established with WWF's support. In 2011 the first certified responsible soya was sold in Europe, and the scheme continues to gain momentum. Certification is an important tool that can be used to help mitigate the impacts of land-use conversion and subsequent GHG emissions relating to the livestock sector[89].

Extensive production systems

While defining 'better' as consumption of meat with a lower GHG impact makes sense, this narrow conception of 'better' has potentially negative implications for other important environmental objectives. More extensive systems, typically associated with higher levels of animal welfare and environmental stewardship, rear slower-growing animals, which during the course of a longer life require more feed energy and produce more methane, increasing their GHG impact. Forages available to ruminants grazing more marginal land are less digestible than feed concentrates, causing animals to emit greater quantities of methane than their intensively-reared counterparts[90]. However, nitrous oxide emissions may be lower in such systems and may balance/exceed any increase in methane emissions. Also in making such comparisons, careful attention needs to be paid as to whether emissions associated with feed and fertiliser production outside the UK have been fully factored into the calculations for intensive systems[91].

However, with less of a focus on maximising yield, more extensive production methods provide greater potential for environmental protection, higher levels of biodiversity and good animal welfare. Even with the best husbandry skills, the most

intensive systems are unlikely to deliver improved animal welfare outcomes alongside economic and environmental efficiency. Moreover, a drive towards breeding animals for ever quicker growth and greater yields is also unlikely to deliver optimal animal welfare outcomes. Some current intensively-reared broiler chickens are particularly associated with incidents of poor animal health[92].

More extensive farming methods are also generally less intensive in energy use (excepting chicken production). And to the extent that they are self sustaining (through producing their own animal feed) they are not a driver of land-use change abroad[93]. Additionally, life cycle analyses comparing specific animal production systems may fail to reflect potentially beneficial impacts of livestock being integrated in a mixed farming operation[94].

For these reasons defining 'better' meat consumption in isolation as having less GHG impact is problematic. Encouraging consumption of meats with lower GHG impacts, but more intensively reared, at the expense of more extensive production systems might lead to unforeseen environmental consequences, for example reducing demand for meat from livestock farming on marginal land which has little other food producing use. Such grazing plays an important role in managing grassland habitats and landscape, sequestrating carbon in permanent pasture, and providing economic and employment benefits for local communities.

Better consumption could therefore be broadly defined as consumption of meat from farming approaches that are less intensive than conventional systems, rely on fewer inputs and have a greater focus on environmental protection and animal welfare. Such a 'self-sustaining farming system' is the core idea underpinning organic systems and other similar approaches. This requires thinking about livestock production and consumption in the context of the whole food system. In traditional agriculture, livestock production is constrained by the local resources available to feed the animals[95]. With the best land used to grow food crops, ruminating livestock play a valuable role, converting grass on land that can't be farmed and which humans can't eat, into meat which they can eat, with mono-gastrics (chickens and pigs) similarly converting leftover food waste (if regulations allow) and crop surpluses into meat. As there are no external inputs into this form of livestock production, the GHG emissions from ruminant digestion is limited to the carbon in the grass they have eaten and which it can reabsorb[96].

This shift in livestock production from a resource constrained activity to a demand led activity is seen as the root of the problems caused by the livestock sector, with conventional production systems reliant on limited fossil fuels and putting animals in competition with humans for arable land on which to grow crops. Methane from ruminants becomes an issue because external inputs into the farming process enable them to expel more GHG than can be reabsorbed into the grass they are grazing[97]. From this wider systemic perspective, animals take a more marginal role in the wider food production system and therefore 'better' meat consumption is 'less' meat consumption, from extensive self-sustaining farming systems.

Less GHG impactful animal species

Another element of 'better' for reducing GHG impacts could be the consumption of meat from less impactful animal species such as chickens and pigs. Both are associated with lower GHG impacts than ruminants as they don't produce methane during digestion and they take up less land. They have higher feed conversion rates than ruminants and faster reproductive cycles, meaning that new genetic traits can be introduced more quickly[98].

This approach to better meat consumption appears to be under consideration in policy circles. The government's *Food 2030* report points out that the UK's most popular meat – chicken – also has the lowest GHG impact[99]. In a case study looking at the formulation of a pre-packaged curry for the recent Defra Green Food project[100], the impact of different meats was assessed. Chicken was identified as the least impactful, pork next, followed by lamb and beef (though the trade-offs outlined below were also discussed).

The consumption of specific meat species can be considered from a resource use perspective as well as from a climate impact perspective. With wider system concerns about the adequacy of food supply for a growing population, animals that can most efficiently convert protein from plants into protein for humans might be considered better. Although estimates of feed conversion vary, chicken is essentially the most efficient converter of feed into meat, followed by pork with beef the least efficient. All are less efficient than many farmed fish[101] and although fish have not previously been considered in the land-use and food production efficiency debate, perhaps it is time to revisit this, with an emphasis on fish from credible certification schemes such as that managed by the Aquaculture Stewardship Council (ASC).

The argument that chicken and pigs constitute better meat consumption than beef and lamb is far less clear-cut than feed conversion rates suggest. The alternative uses of land for animal rearing provide another way of thinking about resource use. In commercial systems, poultry and pigs are essentially reared on arable land. Although they take up less space than ruminants, in spite of efficient feed conversion ratios, they are reliant on further arable land to provide their feed crops[102]. As this arable land could in theory be used to grow crops for people rather than animals this could be considered a better use of resources. Ruminant livestock grazing on pasture with little other agricultural value could, on the other hand, be seen as an efficient use of land, with their ability to digest cellulose and convert grass which we can't eat into protein which we can.

One of the ongoing debates about the climate change impact is the value that grazing land provides in sequestering carbon and therefore mitigating some climate impact, a benefit that ruminants provide and mono-gastrics do not and which potentially generates a more positive impact for extensive production in comparison to intensive systems. Despite a growing amount of literature this remains a contested issue[103]. The ability of grassland to store carbon is ultimately limited in that there is only a certain amount of carbon that soil or plants can take up[104]. However, in maintaining grassland, ruminant production plays an important role in preventing additional carbon losses[105].

Shifts to intensively produced chicken and pork away from red meat also raise animal welfare issues. Intensively reared chickens and pigs that deliver the lowest GHG impact are also associated with incidents of poor animal welfare in the UK and abroad[106].

From an environmental perspective, there are advantages and disadvantages with each of the main animal species we consume. In the UK, the trend over time has been increased chicken consumption and lower consumption of red meats, driven by the production and promotion of intensively farmed chicken. While this may nominally be a move in the right direction in terms of GHG impact, in reality the situation is more complicated, with ruminant livestock providing important benefits. This indicates that 'better' is more likely to be achieved through the choice of production systems rather than solely on species choice.

4.3 Better for biodiversity

While a range of environmental outcomes are affected by meat production, we've identified biodiversity as an important element to consider in its own right. Better meat production can be defined as minimising the indirect negative impacts on biodiversity from land-use change for animal feed production and also directly enhancing biodiversity. This can provide win-wins for producers and consumers.

Naturally grazed, grass-fed livestock avoid much of the impact of intensively produced cereal-fed animals and have benefits for biodiversity and for producers. It's been demonstrated that organic farming systems are better for biodiversity[107]. In Wales and south-west England, nearly 10% of agricultural land is now managed organically, and 5% of Welsh livestock is produced organically[108].

A number of newer schemes are supporting farmers and developing markets for the products of such systems. For example over the last three years, the RSPB[109] has supported farmers in the UK to deliver top quality habitat management for the benefit of biodiversity as part of a profitable farming business.

In Sweden, WWF[110] has supported the development of production standards for pasture beef for environmentally friendly, high quality meat from animals that graze semi-natural grasslands which support a high diversity of species. The scheme is also profitable for farmers due to the low costs for grasslands, higher payment for pasture beef and high agro-environmental support for managing a biodiverse landscape.

In the UK, the Pasture Fed Livestock Association[111] has developed standards. It distinguishes between 'pasture' and 'grassland', owing to the diversity of plant species such as herbs and clovers that are found in well-established fields. These support a diverse range of complex wildlife networks and have an essential role in the nutrition of livestock.

Concerns about declining biodiversity among farm animal breeds led to the establishment in the UK of the Rare Breeds Survival Trust[112], which was set up to help conserve and safeguard Britain's remaining native farm animal breeds from extinction owing to agricultural intensification. In this sense, better could also be defined as meat from rare, locally-adapted breeds.

4.4 Better for animal welfare

Animal welfare policy in the UK has long been guided by the five freedoms that aim to ensure animals are free from unnecessary suffering and have their needs met. These include:

- Freedom from hunger and thirst, by ready access to water and a diet to maintain health and vigour.
- Freedom from discomfort, by providing an appropriate environment.
- Freedom from pain, injury and disease, by prevention or rapid diagnosis and treatment.
- Freedom to express normal behaviour, by providing sufficient space, proper facilities and appropriate company of the animal's own kind.
- Freedom from fear and distress, by ensuring conditions and treatment that avoid mental suffering[113].

In 2009 the Farm Animal Welfare Council (FAWC) proposed a different approach which, rather than focusing on the prevention of suffering and the meeting of needs, looked more positively at the quality of life that farm animals experience. Classifying an animal's welfare simply as either a life not worth living, a life worth living, or a

good life, the FAWC argued that the minimum standard ensured by legislation should be that all animals experience a life worth living, with increasing numbers experiencing a good life[114].

One approach taken by assurance schemes is to take a resource or input-based approach, specifying minimum standards in terms of space, enrichment materials, bedding and so on. Outcome-based approaches look at the animals themselves to determine their level of welfare. Both approaches to animal welfare are important, and work is currently being carried out by the Soil Association, RSPCA and Bristol University to develop an outcome-based assurance assessment[115]. Given the complexity of measuring animal welfare, the FAWC argues that independent governance is needed to set a framework against which to compare higher welfare standards[116].

While good animal welfare is a product of skilled stockmen and investment as well the husbandry system used, certain systems have much more potential for delivering higher welfare standards that would be associated with a 'good life', providing opportunities for higher levels of comfort, interest, pleasure and confidence[117]. Across a range of animals, assurance schemes such as 'Freedom Foods' from the RSPCA and organic standards from the Soil Association provide resources for significantly improved quality of life compared to the minimum UK legal standard[118].

From an animal welfare perspective, better meat consumption could therefore be defined as seeking to consume meat from animals that have been able to live 'a good life'. While this might involve purchasing domestically produced meat from farms that belong to assurance schemes, it isn't always easy to identify high or low welfare meat. For imported meat, for example, it isn't possible currently for consumers to identify even whether production has met UK minimum legislative standards let alone higher standards associated with a good life[119].

Better animal welfare across the sector could be achieved by raising minimum mandatory standards across the EU, more choice editing by retailers/food service sector, and improved consumer labelling and understanding. In our earlier report, *A Square Meal*[120], we highlighted the need for clear country-of-origin labelling for meat and processed meat products, to complement voluntary and regulatory initiatives to raise domestic production standards. This would help enable consumers to reward British farmers for investing in higher production standards.

4.5 Better for farming profitability

The ability of farmers and producers along the supply chain to make an economic return is a key element of a creating a better meat system that can support better meat consumption.

As we said in our earlier report, *A Square Meal*[121], eating less meat on sustainability grounds would be compatible with more profitable farming if a larger share of the meat consumed in the UK were produced here; UK producers exported more; and farmers received a higher return for their meat or for other farming activities that substitute for income lost from meat production.

In our earlier dialogues, producer organisations also accepted that if consumers lowered their GHG emission footprint by eating less meat, this would not automatically threaten the profitability of livestock farmers. The volume of domestic sales is only one factor in profitability, alongside export markets, input costs and farm gate prices. They were cautious about the prospects of achieving higher margins in practice because the trend has been towards tighter margins, with profits driven by

volume.

Profitability for livestock farmers is already challenging. Over the last 20 years, producers have experienced low and negative farm incomes across all livestock sectors, although poultry production in recent years has appeared relatively more profitable[122].

An analysis of Defra's 2010 data on farm incomes found that farm business incomes for lowland livestock grazing were on average two-thirds lower than other lowland farm types (dairy, cereals, general cropping), at just over £21k for the year[123]. Taking into account the valuation of unpaid effort excluded from that figure (i.e. the unpaid inputs of the owner and unpaid family members estimated at over £23k), the average lowland livestock farm in 2010 struggled to make a positive return[124]. There was significant variation between farms: while farm business income of the bottom 35% of farms was below £10k in the year, 25% of farms achieved incomes of greater than £40k[125].

For livestock farmers on more marginal land (categorised by Defra as Less Favoured Areas, or LFAs) the situation is also difficult. Public funding from CAP single farm payments and agri-environmental schemes constitute on average 32% of farm revenues. Along with off-farm diversification, these sources cover the losses associated with farming production in these difficult terrains, but once unpaid labour is factored in, farms generate on average a small loss[126].

Low income has also been an issue within the pig sector. From 2008, pig producers were turning a profit, but increased feed costs coupled with retail promotions are thought by the industry to have pushed produce back into a loss-making position, with pig producers reportedly losing on average £20 per pig in 2010[127]. Even more than with other livestock farm types, there is a great deal of variation in the profitability of pig producers. While the bottom quartile of pig producers in 2010 made significant farm business income losses, the top quartile achieved profits in excess of £100k[128]. Recent reports[129] indicate that pig producers face growing financial pressures, particularly from rising feed costs.

'Less' production could have additional impacts on the livestock sector, including unintended consequences. Reduced demand through less meat consumption could potentially put downward pressure on prices as the same number of producers chase fewer customers. As meat produced from high welfare and extensive systems have higher costs of production it could be these that are most impacted by a less meat strategy. Competition from 'cheaper' imported meat that might not meet the same quality standards as UK meat in terms of the environment or animal welfare may be intensified unless a transition to 'less but better' is also supported outside the UK.

The impact of farm profitability on aspects of better meat consumption is complicated. Very low levels of profitability force farmers to make decisions on financial grounds[130]. They also limit the ability of a farm to invest in improvements in facilities and processes that could enhance environmental performance or animal welfare. Ultimately, improvements to environmental and animal welfare outcomes need to be considered alongside the economic levers that can enable them.

However, there is some evidence that higher value production systems can also deliver on profitability. A Defra-funded review of farm incomes between organic and conventional systems found that organic systems for beef cattle and sheep farms were more profitable than their conventional counterparts where farmers get a premium for organic products[131]. Though the physical production from the organic farms was

lower, the price received was higher.

A reduction in meat demand and a shift in demand favouring meat from higher 'value' production systems may encourage more producers to move to lower volume but higher value-adding business models. Recent experience in the lamb sector has shown that a tightening of supply can have positive benefits in terms of returns to producers[132]. So the impact on producers is not only about changing demand but how production changes in response.

If investment can be made into more sustainable UK production systems, improving quality in terms of environmental and animal welfare standards compared with meat production systems abroad, then there may be a win-win from an environmental and economic perspective from less but better domestic consumption, as well as increasing sustainable UK meat products in international markets. An approach currently being pursued in Ireland that translates as Origin Green[133] positions Irish meat as sustainable, using accreditation schemes that claim to differentiate high-quality low impact products.

There is value in considering whether such an approach could benefit the UK, though further research would be needed to ascertain the potential benefits and trade-offs of such an approach. Experience of higher animal welfare standards in UK pig production is that this is not competitive in international markets. Furthermore a greater emphasis on increasing meat exports could open the UK up to criticisms of exporting production impacts unless similar reductions in consumption and production took place elsewhere.

The converse approach to smaller scale, high value production is the development of large scale intensive 'super' farms intended to deliver the most technically efficient production processes. However, such developments are raising many questions including that of long-term profitability due to rising input costs, as well as questions regarding animal welfare and environmental impact.[134] They are particularly being challenged from social and cultural perspectives, including their impacts on smaller scale producers.

Rising feed costs are a major factor currently affecting profitability across the livestock sector and likely to continue as global demand increases. Moving to 'better' livestock farming that's less intensive and less reliant on imported feed, and which favours home-grown feeds and diverse breeds, could help make farmers more resilient to price fluctuations in commodity markets.

4.6 Better for fairness

Unfairness in the food system has been highlighted through the squeeze on farmers' incomes by supermarkets and other supply chain players demanding lower prices. The Groceries Code Adjudicator[135] (GCA) is intended to address unfair contracts between large retailers and their suppliers, though the potential for GCA to impact positively on producer incomes is limited. The GCA will not cover producers such as farmers unless they directly supply supermarkets.

FEC's Food Justice Inquiry identified the importance of social justice to the challenges facing the food system[136]. Its ethical framework for considering social justice is as applicable to meat as any other food sector. Alongside environmental and health considerations, better meat consumption could also be defined as meat from socially-just supply chains that ensure farmers and workers achieve a fair return, and good working conditions for those producing meat.

Social justice also extends to consumers of meat. It's critical that healthy and sustainable meat is accessible to those on the lowest incomes as well as better off consumers. It's important that the potential for inequality is taken into account in the debate around meat consumption, as a food system that values the environment but reinforces social and health inequality is not really sustainable in any useful sense of the word.

In the context of global meat consumption, the notion of social justice can be applied internationally too. While the developed world consumes more than its fair share of high input foods, including meat, many people in developing countries – particularly children, who don't get an adequate diet – need the protein and micronutrients that meat could provide in their diets[137]. At the same time unhealthy western style meat-rich diets are increasingly being consumed by the more affluent in developing countries. As the world's population continues to grow, it's vital that global consumption, including meat consumption, is re-balanced more equitably.

This growing global demand for meat has a disproportionate negative effect on the rural and urban poor in developing countries.[138] One-third of global crops are used to produce animal feed. It's argued that the rising demand for meat and meat products from the world's richer consumers, and also from the growing middle classes in developing countries, is exacerbating the competition for land and may be contributing to increases in the price of staple foods. Although many of the world's poorest are unlikely to consume the commodities where prices have risen sharpest, nevertheless there is a marked knock-on effect on both general food prices and on staples eaten by poorer people.[139]

4.7 Better for reducing waste

Reducing waste was a key theme that came through in interviews with the advisory group, the industry and in the literature reviewed. Valuing meat as a precious resource, making the most of each carcase and reducing the amount of edible food that ends up in pet food, incinerated or in household rubbish are all advocated as ways of improving meat consumption. Reduced waste potentially means that less meat production is needed for the same level of meat consumption, thus reducing negative environmental impacts. For producers, reduced demand caused by more efficient use of meat has the same impact as if consumers chose to reduce meat consumption directly. Being less wasteful and placing a high value on meat are ideas producers and consumers alike can support.

Better meat consumption as less wasteful consumption can be divided in two main strands of thinking. The first concerns how we value and utilise as much of the meat and by-products of each animal as we can, helping producers to maximise carcase balance. The second refers to how we value meat once it has left the farm gate, ensuring that it isn't wasted through the retail supply chain or in the home.

The demand by consumers for particular cuts of meat at different times means that maximising the balance of a carcase is a challenge for producers. Annual UK demand for back bacon and pork steaks requires pork loins from 23 million pigs, while demand for leg cuts requires 19m pigs, but shoulder and other cuts require only 6 million pigs. With domestic production at around 9.7m pigs, the UK must import to satisfy demand for particular cuts[140]. With beef sales there is seasonality to purchases, with burgers and steaks increasing during the summer barbeque season and more joints of meat consumed over the colder months[141].

Encouraging more 'nose to tail' eating, such that domestic consumers support better carcase use is sometimes proposed as a way of providing increased value to producers

while reducing environmental impact, as less meat needs to be produced for a given level of demand. While there may be opportunities here, there are also challenges in engaging UK consumers who might be 'squeamish about offal' and are used to eating a significant proportion of meat in pre-packaged and processed forms[142].

While valuing and consuming as much of an animal is common sense economically and environmentally, the extent to which it adds value to farmers depends on the potential value added in the UK market compared with international markets. Faced with limited demand for animal by-products, producers currently look to maximise carcase use via export markets, where offal is more highly valued, with new emerging markets and the Far East targeted as growth areas[143]. Therefore it is not wasted.

Better carcase use is not just about changing consumer demand. WRAP estimates that the UK retail supply chain from fresh meat generates 1.4m tonnes of residual material the vast majority of which comes from abattoirs and cutting plants and is rendered down. They suggest that a better environmental outcome would result from recovering more edible by-products from the carcase, including meat, tripe, red offal and other edible co-products[144].

Following the BSE crisis, new legislation on animal by-products specified that certain animal by-products which presented risks to human and animal health had to be incinerated or rendered prior to being incinerated[145]. Due to this legislation and the loss of export market, it proved more cost effective for abattoirs not to separate animal by-products prior to rendering, and as a result animal by-products that could be used in food for humans are rendered along with higher risk material. WRAP estimates that this constitutes missed benefits to the industry of around £110m per year[146]. It identifies export markets in Eastern Europe and Asia as opportunities for increased value for animal offals, edible co-products such as tripe and casing, and 'exotic' cuts such as paddywhack and cartilage. The pet food market is also seen as an opportunity[147].

There is also the prospect of wasting less meat in the home. The 2008 WRAP survey found that the most wasted food items post consumer purchase are bread 32% and vegetables 24%. The project also estimated that 13% of edible meat and fish purchases were wasted. Looking at specific types of meat, 10% of edible red meat purchases were wasted, 14% of poultry, bacon and ham, and 15% of meat products[148]. As meat is relatively more expensive than other food items and has a high climate change impact, initiatives to reduce meat wastage could be expected to contribute to climate change reductions while also delivering cost savings for consumers.

From a production perspective, a reduction in consumer waste would have the same impact as a reduction in consumer purchases, assuming that as a result of wasting less meat, households altered their purchasing behaviour and purchased less. The reduction in waste would create a win for household budgets as the value of that wasted meat is estimated to be around £1,300m. It would also constitute an environmental 'win' if the reduction in purchases translated to a reduction in production[149].

In our earlier report, *A Square Meal*, we recommended a role for industry to convene and coordinate initiatives to promote better domestic carcass use, to create higher value markets for the whole animal.[150]

4.8 Better for quality and taste

While we carried out this research our main focus was on environmental, animal welfare and health aspects. But it's also important to consider the socio-cultural aspects of meat consumption. The meanings and value we assign to meat eating add even more complexity to the discussion about what constitutes better meat consumption.

Better can refer to the quality and taste of meat and meat products. Quality is a difficult concept to pin down – and perceptions of quality may depend on where you sit in the food chain. Taste is also personal – we often like what we are used to.

Quality could refer to the provenance of the meat in terms of its production – for example, free-range or organic. It may reflect a more expensive, rather than a cheaper cut of meat. And it could include consideration of how the meat is treated after slaughter. Quality for some meats might refer to its freshness, or in others its age – for example, supermarkets use the amount of time beef has been matured to distinguish between standard and more premium products[151].

Pleasure is also a key attribute we might associate with better consumption[152]. As with all foods, the pleasure derived from meat is not just a product of the meat itself or how it's prepared, but is also shaped by many other variables including where we're eating, who we're eating with, our cultural upbringing and beliefs, our memories and mental associations of that food. For example, there are significant gender attitudes towards red meat in many cultures. These aspects are so complex that our consumption of food has been described as nothing less than a reflection of who we are[153].

4.9 Better for reconnecting producers and consumers

One way of considering better meat consumption is in the relationships between producers, consumers and animals. Kneafsey et al argue that in the modern food system consumers are 'disconnected' from food and food production, both in terms of the physical structures of food production but also in their perceptions and feelings about it[154]. They argue that this disconnection has had negative consequences both for farmers who have lost influence and autonomy in the food system and consumers who live with 'anxiety' about the food they are eating and for whom 'disconnection' contributes to a lack of access to healthy food[155].

Following this line of thought, better meat consumption could be defined as 'more re-connected' meat consumption, with more direct relationships between farmers and consumers, for example via community supported agriculture schemes, producer/consumer partnerships and farmers' markets constituting forms of 're-connection'[156]. One aspect of connectedness therefore could be defining 'better' as locally produced and supplied meat. While 'local' is often ill-defined and doesn't necessarily in itself imply better environmental credentials, there's evidence of benefit to communities through thriving producers supplying local markets both in the consumer and food service sectors. For example, the National Trust[157] supports and encourages the use of rare or locally-distinctive breeds to add value to meat sales.

Consumer research shows that the provenance of meat is important to many consumers despite the recession. Some 59% of consumers say they prefer to buy UK-sourced meat and poultry, while 48% say they prefer to buy locally-sourced products when possible, according to a 2012 YouGov survey[158].

Finally, and perhaps most importantly, 'better' can be defined as how we value meat through this deeper connection between the person eating the meat, the animal that

provided it and the farmer that reared it, rather than simply seeing meat as a homogenous portion of protein.

5. Discussion and research recommendations

In this section we discuss the findings of the research. We point out gaps in knowledge and opportunities for further research.

5.1 Defining 'better' meat consumption

Our scoping research has identified nine potential ways in which better meat consumption could be defined across a spectrum of outcomes including environmental, social, economic and cultural.

Given the complexity of the challenges that face the meat sector it's not surprising that there are many different ways of defining better. Producer efforts to cut GHG emissions look to reduce the impact of processes already taking place today. Advocates of more extensive production methods look at the reliance of conventional production on limited external inputs and propose a broader shift to self-sustaining farming methods in balance with their environment. Food system thinkers look at livestock production and consumption in the context of the whole food system and global trends and look to a future where meat and livestock takes a more marginal role in a food system geared towards meeting the world's nutritional needs. All these perspectives are relevant and important.

Some definitions appear to offer a spectrum of potential benefits. For example, pasture-fed livestock and more extensive production systems offer benefits for human health, animal welfare and biodiversity, and potentially provide higher margins for producers. A focus on provenance – whether local, regional or national – presents opportunities for connecting and providing benefits for producers and consumers. Also reducing waste throughout the system has multiple benefits and is widely supported. However, making the most of each carcase through 'nose to tail' eating, proposed as one solution to wasting less, may not deliver such significant benefits as envisaged, because a market already exists that exports the parts of the animal that UK consumers reject. We propose that all these definitions are worthy of further in-depth consideration.

Our research also highlights tensions and trade-offs with some approaches to 'better'. Faced with the urgency of addressing GHG emissions, the dominant perspective among policy makers and the mainstream farming industry is to consider 'better' meat in terms of more efficient production processes that have less impact on the climate. There are clearly benefits for the environment and for producers from resource use efficiency, for example more efficient water and energy use. However, defining better meat consumption as having less GHG impact in isolation is problematic.

Encouraging consumption of meats with lower GHG impacts, but more intensively reared, at the expense of more extensive production systems might lead to unforeseen environmental consequences, for example reducing demand for meat from livestock farming on marginal land which has little other food producing use. Such grazing plays an important role in managing grassland habitats and landscape, sequestrating carbon in permanent pasture, and providing economic and employment benefits for local communities. Slower growing, more extensively raised livestock can also offer quality attributes for consumers.

Similarly we conclude that a shift towards chicken and pigs away from beef and lamb as part of better consumption on narrow GHG measurements is too simplistic. We explore alternative definitions of 'better' which include those that are less reliant on external inputs, work more holistically with environmental systems and have the potential for higher levels of animal welfare, including organic systems.

Some definitions of better are in competition with each other, and we conclude it may not be possible to achieve better meat consumption across all outcomes at the same time. While finding a balance between these different conceptions of better may be difficult, we suggest it could be defined more simply in terms of how we approach consumption of meat rather than any specific characteristics. The most important aspect of better may be that in eating meat we recognise it as a valuable resource. By recognising meats as high quality foodstuffs, we're encouraged to recognise and respect the animals that provided it, the farmers that produced it and those in the supply chain that prepared and delivered it. And in recognising its value we'll be less inclined to waste it. Seeking to promote and establish this deeper connection between the person eating the meat, the animal that provided it and the farmer who reared it, rather than simply seeing meat as a homogenous portion of protein, may provide access to the changes in attitudes and behaviour that would encourage more considered meat consumption. This may also create a policy environment where the subject of reducing meat consumption can be more readily discussed.

As we make clear earlier in this report, it is the 'less' in 'less but better' that provides the greatest potential benefits for health, climate change and the environment. Shifts to 'better', however that is defined, may offer benefits over and above less, for both consumers and producers, though arguably the definition of better is less important than the need to reduce consumption overall.

Hence the wording of 'less *but* better' is significant. It suggests that although consumers are being asked to do something they may not want to do (reduce meat consumption) they are offered a trade-off that will provide them with the resources to improve their remaining meat consumption. 'Better', therefore, could be 'whatever the individual consumer wishes to choose as better once they've decided to reduce their consumption, for example to choose meat from higher animal welfare production, support more extensive production, or with health, provenance, biodiversity, and/or waste in mind.

In this way it may be possible to square the challenge of better typically being a more expensive choice. Less but better doesn't necessarily need to cost consumers more if the savings from buying less offset higher costs of better meat and meat products. Yet we cannot assume that if consumers reduce their consumption they will automatically trade up to better. The picture in the current recession is unclear, though one major retailer[159] reports a growth in sales of 'ethical' lines including higher welfare over the last year.

We recognise that consumer behaviour change poses challenges, and we make a number of recommendations below to assist understanding in this area including modelling new 'less but better' consumption patterns for different income groups.

5.2 Implications for production

As the UK food system is intricately linked to foreign markets it doesn't automatically follow that reductions in domestic demand lead to reductions in domestic supply or that this would necessarily be a good thing from an environmental perspective. Environmental benefits from less but better meat consumption assume that production is reduced in response to lower consumption.

However, producers don't only rely on domestic consumers. With global demand for meat increasing, a reduction in UK demand could lead to increased exports. Whether or not this is positive from an environmental perspective depends on the environmental impact of UK producers relative to international producers, and

whether or not they are meeting new demand or taking market share from international producers. If UK production simply switches to service *new* demand abroad then essentially the impact of reducing domestic consumption would be neutral, unless the UK takes market share from international producers.

If UK livestock production can be developed to produce meat with higher environmental and animal welfare standards to differentiate from meat produced from other countries, there may be increased export opportunities, and it could have additional value in encouraging the growth of better consumption in markets where standards have traditionally been lower. There may also be benefits domestically from building demand for better meat that will provide an incentive to farmers to move to higher value but higher cost production systems. We raise the idea that the UK could position itself as an exporter of high quality, sustainably produced meat, as with Origin Green in Ireland. We also recognise that unless production and consumption policies are addressed elsewhere in the world, this could be perceived as the UK undermining its responsibilities towards GHG mitigation.

We recognise there are significant issues to explore further in relation to trade challenges and the market mechanisms that would support less but better meat consumption and production. Rather than focusing on 'less' in isolation, a more successful strategy might be to focus on the economic incentives for more environmentally sustainable and higher welfare farming models that could accompany reduced UK consumption. Ultimately, improvements to environmental and animal welfare outcomes need to be considered alongside the economic levers that can enable them.

We recognise that strategies which can offer economic opportunities are more likely to secure policy and industry engagement. We recommend that further work would help to improve understanding of where the greatest opportunities are within the marketplace to establish the best focus for policies and practices.

We recommend further research to understand:

- **the market mechanisms and policies that would support livestock farmers to diversify and support transition to less but better production;**
- **the policies and mechanisms that could prevent producers of 'better' meat from being undercut by less sustainable, lower quality meat and meat products either imported or domestically produced; and**
- **how the impacts of increased feed and energy costs on producers provide an opportunity to move towards less but better production.**

While this research is a first step towards understanding what less but better meat consumption could mean in practice, applying this to the different livestock sectors has been beyond its scope.

We therefore recommend that the bodies supporting the different livestock sectors undertake work to:

- **more fully evaluate the nine definitions of better identified here, in respect of their sectors.**
- **identify priority definitions for environmental, social and economic sustainability**
- **identify the incentives that would support market transition towards these win-wins.**

5.3 Life cycle assessment challenges

The research also highlights some of the ongoing challenges of measuring and comparing GHG impacts as they relate to livestock production. While a full critique of life cycle assessment methodology for livestock production was outside the scope of this report, it's clear that there is uncertainty and some controversy in the scientific evidence base towards carbon sequestration. More generally, comparability between studies is made difficult by the different assumptions and methods used.

Full life cycle assessment data is needed that includes the impacts of increasing demand for arable crops required for animal feed and the related land-use conversion. Such data is likely to show even more significant impacts of livestock production, particularly for intensively-reared species. Another uncertainty is the value that grazing land provides in sequestering carbon and therefore mitigating some climate impact, a benefit that ruminants provide and mono-gastrics (chickens and pigs) don't, unless they are range reared and fed, and which potentially generates a more positive impact for extensive production in comparison to intensive systems. There's a need for assessment at farm system level as well as individual enterprise.

We recommend that better comparability of data and consensus on methodology of life cycle assessment studies relevant to livestock production is essential to underpin understanding and decision-making. Specifically we recommend work to agree inclusion of impacts of land-use change from animal feed and carbon sequestration through pasture in life cycle assessments.

5.4 Consumer perspectives

Within the scope of this research it wasn't possible to determine consumer perspectives towards less but better meat consumption. As meat prices continue to rise, encouragement of less meat consumption would help consumers lower their food costs by cutting down on meat. The benefits of better, however, depend on the willingness and ability of consumers to trade up. For the majority of consumers this means better meat and meat products becoming more affordable, available through choice editing, and socially acceptable compared to products from more damaging systems.

We recommend further research to:

- **understand how consumers define better meat consumption in the context of a 'less but better' message;**
- **understand the opportunities for and the barriers to less but better meat consumption, for consumers;**
- **understand whether a less but better message is more likely to produce reductions in meat consumption than a simple less message;**
- **identify market segmentation of consumers in relation to less but better meat consumption;**
- **model new consumption patterns for different income groups; and**
- **identify policies and practices by governments and the food chain to help consumers make the transition to less but better meat consumption.**

A specific gap identified by this research relates to how less but better meat consumption applies to those on low incomes. No specific studies were found on the subject of meat and inequality but the challenge of sustainable diets being accessed by those on low incomes is relevant. Food insecurity remains an issue for low-income households in the UK. For those on benefits or on the minimum wage, incomes are

almost certainly too low to access a healthy diet[160].

As meat is typically an expensive item in consumer shopping baskets, in theory there are opportunities to save money if households move to diets that contain less meat. Replacing this with 'better' meat may not be a financial option among the lowest income consumers. Indeed the evidence of current experience in austerity Britain shows low-income households adjusting to higher food prices by switching to cheaper foods[161]. In addition to cost implications, encouragement to switch to a diet with less and/or better meat may make demands on time, skills, and other resources which poorer people are simply unable to meet. The risk is then that encouragement to move to more sustainable diets actually increases inequality[162].

We recommend research to:

- **involve different households experiencing low income in elaborating what policies and practices would enable less but better meat consumption in low-income households;**
- **include retail and producer insights into low-income consumer practices and how these might shift under different policy scenarios; and**
- **analyse policy initiatives and practices, across sectors, to ensure these do not exacerbate inequalities in diet and health in pursuit of less but better meat consumption as part of sustainable diets.**

6. Conclusions and policy recommendations

The report is intended to provide focus for further policy development, engagement and research and to be a catalyst for further exploration of reducing the role of meat consumption within healthy, sustainable diets.

Reducing meat consumption, as part of healthy sustainable diets, is an important yet contentious goal. A consensus on more active policies to discourage meat consumption does not yet exist, despite the benefits for health and the environment. 'Less but better' meat consumption has been proposed as a more palatable message and one that could deliver benefits over and above those achieved through 'less' meat consumption alone. Yet there is no clear understanding, among producers or consumers, of what less but better might mean. This research is a first step towards defining the scope of less but better meat consumption.

We identify a range of ways to define 'better' meat consumption across a spectrum of outcomes for climate change, the environment, animal welfare, human health, livelihoods, social justice and social values. Our research highlights a number of win-wins between these outcomes. For example, pasture-fed livestock and more extensive production systems offer benefits for health and biodiversity and potentially for animal welfare and producers. Also, reducing waste throughout the system has multiple benefits and is widely supported. A focus on provenance – whether local, regional or national – presents opportunities for connecting, and providing benefits for, producers and consumers. Reconnecting people to food and farmers may provide access to the changes in attitudes and behaviour that would encourage more considered meat consumption. Furthermore, less but better doesn't necessarily need to cost consumers more if the savings from buying less offset higher costs of better meat and meat products.

We also found trade-offs between definitions, and we conclude it may not be possible to achieve better meat consumption across all definitions at the same time. In particular, defining 'better' meat consumption as having less GHG impact in isolation is problematic. For example, more extensive systems, typically associated with higher levels of animal welfare and environmental stewardship, rear slower growing animals which during the course of a longer life require more feed energy and produce more methane, increasing their GHG impact. Such judgements are complicated by the need to include the impacts of land-use change from animal feed, nitrous oxide emission and carbon sequestration through pasture in life cycle assessments.

We also recognise that climate change, environmental and producer benefits from less but better meat consumption are only potential benefits as the relationship between consumption and production is not clear cut given meat imports (42% of UK consumption) and exports (20% of UK production). Hence reduced UK consumption would not necessarily translate into reduced UK production and may have unintended consequences. Neither can we assume that if consumers reduce their consumption that they will automatically seek out UK-sourced meat and trade up to better meat that provides better economic returns for farmers.

We also raise the idea that the industry could mitigate potential lower UK sales by positioning itself as an exporter of high quality, sustainably produced meat. However, we recognise that unless production and consumption policies are addressed elsewhere in the world, this could be perceived as the UK undermining its responsibilities towards GHG mitigation. The EU's Roadmap for Resource Efficient Europe and reform of the Common Agricultural Policy potentially offer scope for a coordinated approach to sustainable consumption and production policies, including

economic incentives for more environmentally sustainable and higher welfare farming models that could accompany reduced consumption.

We identify a number of gaps in evidence, discussed above, and recommend further research to understand the market mechanisms/policies that would support livestock farmers to diversify and support transition to less but better production, improvements in life cycle assessments relevant to livestock production, and consumer research to understand whether a less but better message is more likely to produce reductions in meat consumption than a simple less message and to understand the perspectives of low-income consumers.

Despite these complexities and gaps, we conclude that compelling evidence exists for UK governments and the industry to acknowledge the importance of reduced meat consumption as part of healthy, sustainable diets, and to commit to explore a less but better approach further. We welcome the recognition of the importance of sustainable food consumption within the next steps of the Green Food partnership project[163] and the intention to facilitate a 'wider and more sophisticated debate across the whole food chain about the role diet and consumption play in the sustainability of the food system'.

We recognise that to be effective, strategies for both less and better meat consumption need to be approached in a holistic way engaging all stakeholders across the supply chain and taking into account domestic and international factors. The debate around 'less but better' meat consumption often focuses on the two ends of the supply chain – i.e. farmers and consumers. While there is logic in this because the most significant climate change impact is pre-farm gate and ultimately consumption is the driver of all meat production, it's not sufficient for considering the impact of consumption-related policies because of the role of other stakeholders in the supply chain. Retailers in particular are powerful players, acting as gatekeepers to consumer choice and preference and having considerable influence over supply chains. WWF's report *Selling Sustainability?* identifies the central role of retailers in influencing consumers towards sustainable diets.[164] Ultimately the development of better meat consumption strategies relies on cooperation between producers, processors, retailers, consumers, civil society organisations and policy makers.

We specifically recommend that the next steps for Defra and its partners in the Green Food project include work to:

- **define sustainable diets, including the role for less but better meat consumption;**
- **convene a symposium to engage a wide range of stakeholders to explore the issues raised by this report;**
- **explore mechanisms and policies that would support transition to less but better meat consumption and production;**
- **engage all players throughout the food chain and develop actions for producers, processors, retailers, consumer organisations, civil society organisations and policy makers together; and**
- **actively engage with EU policy processes to support the transition towards sustainable food consumption and production.**

Appendix A – Advisory group

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Appendix B – Trends in household meat consumption

Average weekly quantity per person of meat and meat products for household consumption

All figures in grams (g)

Household Purchased Food and Drink	1974	1980	1985	1990	1995	2000	2005-06	2010
Uncooked and Unprocessed Meat								
Carcase Beef and Veal	189	208	167	134	109	113	117	114
Carcase Mutton and Lamb	113	128	92	82	54	54	53	44
Carcase Pork	91	118	98	84	71	68	53	53
Chicken	115	141	146	164	166	170	182	181
Other Poulty	12	23	22	26	28	23	33	19
Other Fresh and Frozen Meat	3	3	1	1	2	1	2	2
Liver and offal	51	51	38	25	15	8	5	5
	575	671	564	517	445	437	445	419
Processed and Cooked Meats								
Ready meals and convenience meat products	27	53	68	79	106	150	151	161
Bacon and ham,	141	145	132	114	111	108	115	113
Cooked poultry not purchased in cans	5	6	9	14	23	43	48	41
Corned beef, canned or sliced	12	20	24	21	18	12	13	10
Other cooked meat	16	13	15	10	9	7	12	12
Other canned meat and canned meat products	48	34	35	31	36	30	31	26
Sausages, uncooked - pork	59	54	42	35	43	52	61	62
Sausages, uncooked - beef and other sausages	48	46	50	39	25	14	7	4
Meat pies and sausage rolls, ready to eat	21	21	21	18	22	23	25	24
Meat pies, pasties and puddings, frozen or not frozen	27	21	24	25	33	30	52	52
Burgers, frozen or not frozen	11	28	30	27	30	24	22	22
Paté and delicatessen-type sausage	6	17	16	15	17	18	13	17
Meat pastes and spreads	10	5	4	4	3	2	1	1
Takeaway meats	16	25	36	51	66	63	60	52
	449	490	505	483	541	578	611	597
Average weekly quantity of meat and meat products	1,023	1,160	1,069	999	986	1,014	1,057	1,016

Source: DEFRA Family Food data spreadsheets
Available at http://www.defra.gov.uk/statistics/foodfarm/food/familyfood/datasets/
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Sustainable food in numbers

48%

In the UK, meat dishes are responsible for nearly half of our food greenhouse gas emissions

2X

Meat consumption in the UK is approximately twice the world average

£1.2BN

estimated cost to the NHS of early deaths related to excessive meat consumption

58%

of men in the UK exceed the recommended red meat target of 70g per day

30%

Nearly a third of global biodiversity loss is attributable to livestock production

Why we are here
To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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