

Pigs and the Environment



A report to BPEX
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HERETOMORROW

PIGS AND THE ENVIRONMENT

Foreword

As part of its approach to environmental and social sustainability, BPEX is interested in the views of a wide range of interested groups. We therefore commissioned Here Tomorrow to conduct a critical appraisal of the English pig industry and asked it to make recommendations on what BPEX should do in the future.

This Report, "Pigs and the Environment", is the result of that approach and reflects the opinions of the author. BPEX will be discussing its themes and recommendations with a wide range of interested groups so that we can help the English pig production and processing industry address the challenge of environmental sustainability in the most effective way.



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Abstract

Like all economic activity, pork production and consumption causes environmental impacts; these are primarily climate change, air pollution, water pollution and loss of biodiversity. These impacts tend to be lower for pork products than for beef and lamb, but higher than for poultry and almost all non-meat sources of protein and fat. BPEX should continue and expand its efforts to enhance the environmental sustainability of the pork system by: focusing less on maximising production as an end in itself, and more on assuring that pork production and consumption is met sustainably from domestic production; developing, with Defra, a Pork Roadmap, similar to those for dairy and (soon) beef; and further expanding research on environmental impacts other than greenhouse gas emissions, to include water resources, biodiversity, acidification, eutrophication, abiotic resource use, and waste. BPEX should further develop expertise and advice to help farmers measure and reduce their environmental impacts, processors and retailers to improve eco-efficiency, consumers to choose, store, cook and dispose of pork products and packaging more sustainably, and regulators to deliver the right framework. A broader engagement with consumers, retailers and policy makers will also be required, since the complex trade-offs between needs, values and impacts must be guided almost as much by human values as by ecological limits.

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Executive summary

Sustainability, food and pork

There are many definitions of sustainable development, but the first and most influential is: "Meeting the needs of the present generation without compromising the ability of future generations to meet their needs". Sustainability is increasingly being understood and approached as a systemic concept that depends not only on the environmental impacts of individual products, services, companies or technologies, but also on the value that people derive from it, in the form of income, nutrition, amenity and social benefits. However, no system can be sustained in the long term if it exceeds the Earth's overall "carrying capacity" – its ability to process wastes and provide provisioning and regulating services, including a stable climate, flood regulation, pollination, food and fibres. Most of these environmental services are in long-term decline, threatening the wellbeing and livelihoods (including diets) of humans around the world, including the UK.

Sustainable systems have a common property: they do not use up natural resources faster than our planet can replace them. Currently, the global human socio-economic system is consuming natural biotic resources 25% faster than they can be replaced, and the majority of ecosystem services are in decline. Currently, the world uses around 25% more resources than the Earth can provide on an ongoing basis. As the global population expands to 9 billion by 2050, and as rising levels of affluence boost demand per capita, the consumption of food – and especially of animal products – is expected to rise dramatically, as it has already done in Europe, where meat consumption has increased by 63% in the last 40 years. Meeting this demand is a huge challenge in its own right; to doing so "sustainably" may not be possible. At the very least it will require unprecedented levels of expertise and creativity on the part of policy makers, food producers and retailers.

The consumption of food is responsible for around a fifth of the UK's greenhouse gas (GHG) emissions.¹ Of this, about a third (or 7% of UK GHG emissions) comes from agriculture and land use; the other two-thirds lie elsewhere in the value chain – in processing, retailing, consumer use and waste. In the case of pig products, the majority of GHGs are in the form of carbon dioxide (CO₂) and arise predominantly at opposing ends of the food chain: in production, they come from growing and importing soya cake from Brazil and Argentina, where it is fed with fossil-based fertilisers and sometimes grown on land cleared from tropical rainforests; in consumption, they arise mainly from refrigeration, cooking and waste. A relatively lower proportion arises from processing, transport and retailing.

Though less GHG intensive than beef or lamb, pork production and consumption makes a significant contribution to climate change and other (often associated) environmental impacts, such as water quality and quantity. These impacts, in turn, affect the amount, types and quality of food available to us in our shops, gardens and restaurants.

In the UK, no government body has overall responsibility for managing food's environmental impact. Instead, responsibility is spread across a range of government departments and is influenced by both national and European legislation. In July 2009, the UK Government published the Low Carbon Transition Plan, according to which the farming, land and waste sectors should contribute about 4% of the overall cuts in GHG emissions between 2018 and 2022.

BPEX, as an important enabler and influencer of policy makers and food producers, and with an

¹ FAO, 2009.

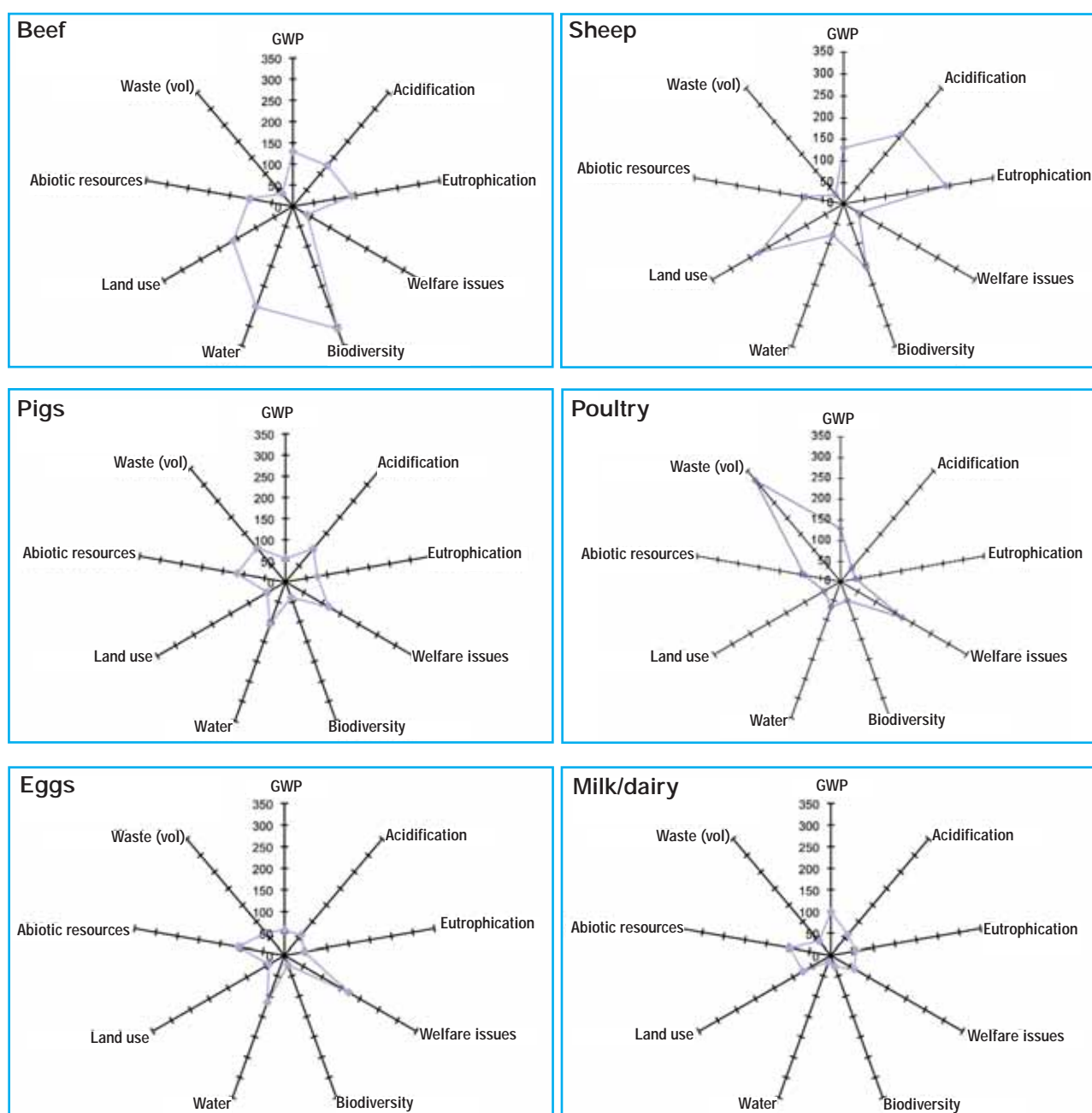
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obligation to consider the needs of consumers, must play its part in conceiving and realising a sustainable food system, including this GHG-related target. In order to do so, this report proposes that BPEX should begin to focus less on maximising production as an end in itself, and more on assuring that pork production and consumption is met sustainably from domestic production.

Environmental impacts of pork production and consumption

As with all meats, the production of pork products causes a range of environmental impacts, including climate change, eutrophication, acidification, the use of abiotic resources, pesticide pollution to soil and water, and the use of land that could otherwise be given over to other purposes (such as wilderness or growing vegetable food stuffs). Figure 1 plots how each of the major animal product groups performs against each of these criteria. (The axes are indices, representing the averages across the whole group of products; for the raw data, please refer to the relevant section in the body of the report).

Figure 1 Comparison of the environmental impacts per tonne of livestock products²



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When all of these factors are taken into account, pork is less environmentally impactful than an equivalent unit of beef or lamb. Unlike the rearing of ruminants, however, pig rearing does not help to keep carbon locked in the soil, and it does not provide positive environmental services. Per unit of weight, pork is more impactful than poultry, but the volume of poultry sold is so much greater that it has higher overall impacts than pork. When consumption volumes are taken into account, dairy products and eggs have the greatest impacts.

A third of the world's cereal harvest and over 90% of its soya is used for animal feed.³ Because it takes many times more of these cereals to grow meat than to make vegetarian foods, some environmental campaigners are calling for people to reduce their meat consumption. If UK consumers were to eat less meat for environmental purposes, then beef or lamb might appear to be the most obvious candidates for reduction. However, the picture is complicated by the fact that most sheep and many cattle are raised on land that has few other agricultural uses and high social value in its current form; pigs, on the other hand, are generally reared out of sight on land that can be used for a variety of other purposes, some of which are less carbon intensive. Pigs, therefore, face more "competition" than cows or sheep for environmental resources.

This assumes that the environmental impacts of feed crops are equivalent to those of crops destined for the food chain. Depending on whether or not this is the case, it may or may not be reasonable to argue that land used to grow animal feed crops should be given over to the production of food crops for humans. Where crops are suitable for either animal or human food, one might argue that they should be used for the latter, rather than the former. Further research on this question may be required.

Human health

Campaigners who call for reductions in meat and dairy consumption also claim that such reductions would benefit human health. (For example, high levels of saturated fat have been associated with heart disease and Type II diabetes). In the UK, there is mounting pressure from non-governmental organisations to update the government's nutritional guidelines (known as the "Eatwell Plate") to take account of the environmental and welfare impacts of its constituents. However, there is currently little appetite on the part of the Department of Health (DoH) to undertake such a complex and commercially sensitive exercise.

² Data on GWP, acidification, eutrophication, land use and abiotic resources is from *Determining the environmental burdens and resource use in the production of agricultural and horticultural commodities*, Williams et al., Cranfield University/Defra, 2006. Data on biodiversity is from *Living Planet Report*, WWF-UK, 2008. Data on water is from *Water footprint: The impacts of the UK's food and fibre consumption on global water resources. Volume 1*, WWF-UK, 2008. Data on waste is from *The Food We Waste*, WRAP, 2008. Data on welfare is from *Attitudes of Consumers Towards the Welfare of Farmed Animals*, Eurobarometer, 2005. Welfare scores are based on public perceptions, rather than objective measures; as such, they only measure reputational risk and commercial opportunity. GWP stands for "Global Warming Potential" (see 2.2).

³ LEAD/FAO 2006 Livestock's long shadow environmental issues and options.

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Culture

Food is far more than a way to maintain healthy, vigorous bodies and minds: it is the symbol and focal point for a wealth of familial, social, cultural and religious rituals; it is a predictor and product of our geographic, social and economic background; it is the subject of media entertainment and public campaigns; it is the stuff of habit; it is a statement of who we are, both individually and collectively.

It is important for pork producers and processors, and for retailers, to understand these relationships at a deep level, and to consider cultural impacts when formulating environmental policies.

Animal welfare

Consumers claim to be highly concerned with animal welfare, although their purchasing habits do not always reflect this concern. Consumers are more informed and concerned about hens than pigs, about which they have few concerns and little knowledge. A little over half of consumers think that pigs are fairly or very well treated. This figure rises to three quarters for dairy cattle, perhaps because grazing cattle are more visible in the British landscape; the sight of cows, sheep and pigs living outdoors, sometimes in idyllic rural settings, convinces consumers that they must be leading a decent life. Those who have visited a farm that rears animals have a higher opinion of pigs' living conditions than those who have never visited such a farm.

In Europe, women, younger people, more educated people and those on the left of the political spectrum are the harshest judges of pig welfare standards. Those more optimistic about the welfare of pigs are more likely to live in a rural area, or to have finished their education at a young age. Perceptions of UK standards of pig welfare compare favourably with those of our immediate neighbours, and better than the European average; however, several countries in the Nordic and Baltic regions (including Sweden and Finland) are perceived as being superior. Danish perceptions are notably worse than for both the UK and Europe as a whole. The extent to which these differences reflect true levels of animal welfare is unresolved.

Sometimes, there can be a tension between environmental impacts and perceptions of animal welfare. For example, some studies show GHG emissions for outdoor-bred livestock to be higher than for those bred in indoors, where welfare is perceived to be lower.

Land use and amenity

70% of Britain is covered by farmland – a high proportion when compared with other countries. Livestock that occupy grassland take a disproportionately high share of this, because grazing pasture land is often marginal and not suitable for growing other food crops or species. The land use attributed to the products of live animals, such as milk and eggs, is even lower, because the animals produce consumable products during their lifetimes.

Major shifts in agriculture and horticulture produce major shifts in the appearance of our landscape; in considering how to alter the mix of production, it is important to consider how people may be affected by such changes. People who have grown up in agricultural communities, or who use them for recreation, tend to resist the intensification or urbanisation of traditional farmland. They may also be expected to be more protective of land used for rearing cattle and sheep than of that used for rearing pigs, because of its higher perceived aesthetic and recreational value.

Food security

There is currently enough food in the world (in terms of calories per capita) to feed the entire global

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population. However, food production will need to increase dramatically to meet future demand, and there will need to be improvements in distribution and access. At the same time, less land will be available, and public pressure to reduce environmental impacts will grow. Already, pig producers feel under pressure from the market to raise their livestock indoors, in intensive farming systems. Since it takes more land and energy to produce a calorie of meat than a calorie of grain, the proportion of meat in future diets is becoming an increasingly important topic of discussion amongst policy makers and campaigners concerned with food security.

Consumers

Most consumers consider meat and dairy products to be nutritious, wholesome parts of every day life, deeply embedded in the British culture and in many resident ethnic communities. For this reason, and because of the great variety and high quality of many meat products, retailers view fresh meat as a key area for attracting shoppers. For their part, many shoppers judge the quality and value of a store by the quality and value of its fresh meat section.

At the same time, retailers have extensive climate change-related programmes, and are looking at how their policies and practices (including “choice editing”, “choice influencing” and guidelines for meat suppliers) might be altered in the interests of sustainability.

Retailers, processors and industry associations are also being asked to consider how messages carried to consumers – whether on pack or through other marketing channels – should be expressed and regulated. Defra is conducting an industry consultation with a view to updating its Green Claims Code, and there is vigorous debate about the use of labels and third party certifications. BPEX will have a role to play in responding to the Defra consultation.

Recommendations

BPEX should continue and expand its efforts to enhance the environmental sustainability of the pork system by:

- Focusing less on maximising production as an end in itself, and more on assuring that pork production and consumption is met sustainably from domestic production
- Developing, with Defra, a Pork Roadmap, similar to those for dairy and (soon) beef
- Further expanding research on environmental impacts other than GHG emissions, including water resources, biodiversity, acidification, eutrophication, abiotic resource use, and waste.

In further pursuit of the above, BPEX should:

- Continue and expand its efforts to improve the environmental impacts of feed, including:
 - Increases in the proportion of sustainable soya used in feed;
 - Development and use of alternative feed stocks, such as lupines (a type of legume with promising potential), rape (which is already prevalent), peas, beans and waste products, to improve both primary impacts and enteric fermentation; *and*
 - The use of genomics to improve productivity and reduce both morbidity and mortality in livestock.

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Recommendations *cont'd*

- Participate in the development of more efficient, integrated agricultural systems, taking lessons from the various types of existing intensive and extensive systems, as well as supporting research into new techniques
- Support and inform efforts to eliminate waste throughout the value chain, and to make full use of unavoidable waste in energy generation and fertilisation
- Support efforts to improve the efficiency and take-up of second-generation biofuels
- Support and inform efforts to analyse, manage and improve water management
- Support and inform efforts to reform and improve market frameworks in the interests of environmental sustainability, including the Common Agricultural Policy, the EU's Emissions Trading Scheme, and the forthcoming climate negotiations in Copenhagen
- Work with other organisations in the AHDB, and with sister organisations in other countries, to develop "joined-up thinking" on sustainability in agriculture and food
- Develop insights and messages that help environmentally-concerned consumers to make informed purchasing decisions, including appropriate use of labels, claims and nutritional advice
- Consider how to communicate to consumers the activities and nature of farms and processing facilities, whilst maintaining effective bio-security.

1 Introduction

Industrialised nations are beginning to face up to a series of daunting challenges: the need to avert catastrophic climate change; the associated need to cut carbon emissions by at least 80% by 2050, and to reverse their growth within just a few years; the need to arrest the unprecedented rate of biodiversity loss and extinctions of which we are an important cause, and which is threatening our ability to feed ourselves; and the need to provide adequate food and fresh, clean water to a projected population of 9 billion people by 2050. Being "sustainable" means meeting these challenges.

This report is an attempt to understand the place of pigs and pork products within a sustainable UK economy, and the role of BPEX in fostering sustainability improvements throughout the pork value chain. In Chapter 1, the report gives a snapshot of today's system of pork production and consumption, and explores its interactions with the broader socio-economic and biological systems. In Chapter 2, it goes into more detail about each of the types and levels of impacts, including climate change, acidification, eutrophication, water stress, biodiversity, abiotic resource depletion and deforestation. A subsequent series of chapters looks at broader relationships: with diet and human health (Chapter 3); culture (Chapter 4); animal welfare (Chapter 5); land use (Chapter 6); food security (Chapter 7) and consumers (Chapter 8). A series of recommendations is given at the end of the main report.

It should be noted with regard to Chapter 5 that, whilst the question of animal welfare is not universally considered relevant to the sustainability agenda, it is relevant to society, and therefore to BPEX in formulating its policies and strategies.

2 Context

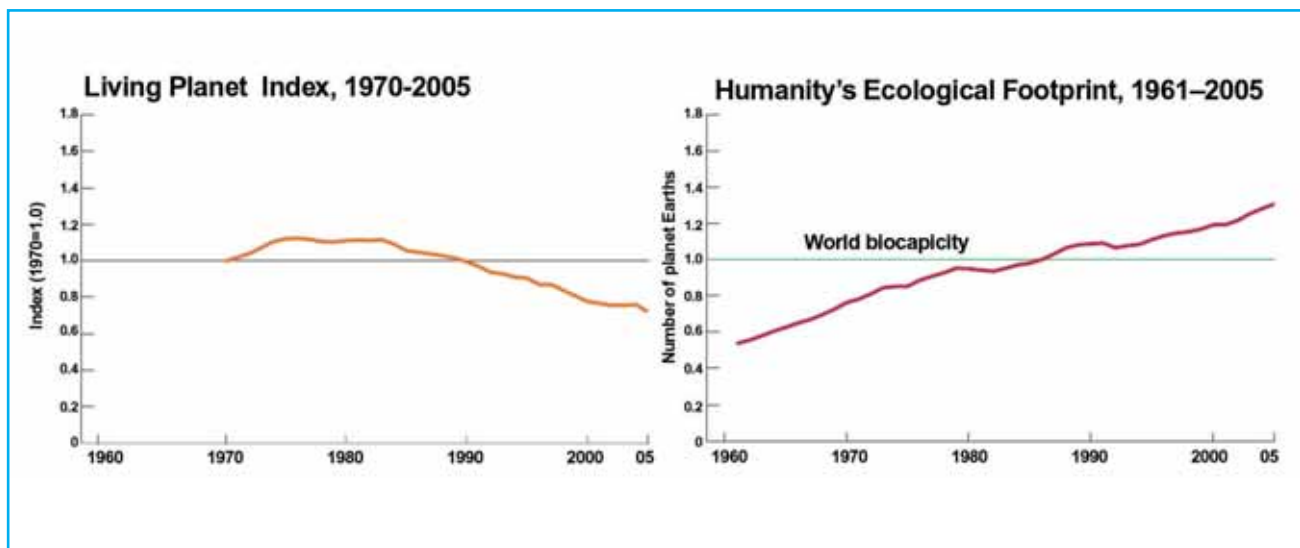
2.1 Sustainable development

There are many definitions of sustainable development, but the first and most influential is that of the Brundtland Commission's 1987 report for the United Nations, *Our Common Future*:⁴ "Meeting the needs of the present generation without compromising the ability of future generations to meet their needs."

Our understanding of the scale of this challenge is constantly evolving. For example, sustainability is increasingly being approached as a systemic concept: whether or not a particular product, company or sector is "sustainable" depends upon whether or not it is part of a sustainable system. In turn, sustainability depends not only on the environmental impacts of individual products, services, companies or technologies, but also on the value that people derive from it, in the form of income, nutrition, amenity and social benefits. Even some products that are highly carbon intensive or costly can be justified if less valued alternatives are abandoned in sufficient measure. However, no system can be sustained in the long-term if it exceeds the Earth's overall "carrying capacity" – its ability to process wastes and provide provisioning and regulating services, including a stable climate, flood regulation, pollination, food and fibres.

According to the UN's Millenium Ecosystem Services Assessment (MEA)⁵ most of these environmental services are in long-term decline (see Section 5, below). So is the variety and abundance of wildlife on Earth; biodiversity has declined by over a quarter since 1990, while humanity's "ecological footprint" has risen steadily to 25% above sustainable levels (Figure 2). Were all humans to have the same environmental footprint as residents of UK, we would need three planets to support us.⁶

Figure 2 Human demands on the Earth's biological resources exceed the Earth's ability to replenish them by around 25%⁷



⁴ *Our Common Future*, Oxford University Press, 1987.

⁵ *Current State and Trends*, Millennium Ecosystem Assessment Project, 2005.

⁶ *Living Planet Report*, WWF, 2008.

⁷ *Ibid.*

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2.2 Sustainable production and consumption

In May, 1995, the World Business Council for Sustainable Development (WBCSD) offered the following definition of sustainable production and consumption (SCP): “[SCP] involves business, government, communities and households contributing to environmental quality through the efficient production and use of natural resources, the minimisation of wastes, and the optimisation of products and services. [Business must] take a leadership role in promoting sustainable patterns of production and consumption that meet societal needs within ecological limits. Business can best work towards these goals through responsible environmental management, enhanced competitiveness and profitable operations.”⁸

Four years later, following the World Summit on Sustainable Development in Johannesburg, the UN initiated the Marrakech Process to help countries foster greener business models and more sustainable consumer lifestyles. The Marrakech Process has spawned a number of on-the-ground initiatives, focusing mainly on resource efficiencies, such as recycling, energy efficiency and renewable energy.

Since then, population growth, affluence and environmental challenges have conspired to put intolerable strain on the forces of production, so calls have grown for greater management of consumption. In 2008, the WBCSD declared: “Current global consumption patterns are unsustainable... It is becoming apparent that efficiency gains and technological advances alone will not be sufficient to bring global consumption to a sustainable level; changes will also be required to consumer lifestyles, including the ways in which consumers choose and use products and services. We recognise the need for business to play a leadership role in fostering more sustainable levels and patterns of consumption, through current business processes such as innovation, marketing and communications, and by working in partnership with consumers, governments and stakeholders to define and achieve more sustainable lifestyles.”

In the UK, a number of government-run or -sanctioned bodies are working on this topic, such as Defra's new Sustainable Consumption and Product team, and the Sustainable Development Commission (SDC). These bodies are already at the limit of what is politically expedient for the current political climate, but some of their members go further. For example, a group of sustainability economists, led by the SDC's Economics Commissioner, Tim Jackson, is developing the idea of “steady state economics” and “development without growth”.⁹ Variations on this thesis are gaining currency within Defra and, to a lesser extent, the Environment Agency. A recent conference on SCP,¹⁰ hosted by the Environment Agency and featuring eminent economists, attracted representatives from central government and a host of Regional and Local Development Authorities. However, this agenda has yet to make an impact in the more powerful and influential departments of the Treasury and Berr.

Regardless of the broader debate over overall consumption levels, companies and sectors that are seen as big polluters – including farmers and meat producers – are facing calls for reductions in the consumption of their products. Ultimately, the extent to which such calls are heeded by policy makers and consumers depends not only on environmental limits, but also upon societal values, and specifically on the relative importance that UK society places on such considerations as tradition, landscape aesthetics, taste, environmental conservation, climate change and health. Understanding these considerations is as important as understanding the science and data behind environmental impacts.

⁸ WBCSD, Sustainable Production & Consumption from a Business Perspective, 1997.

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2.3 Food consumption

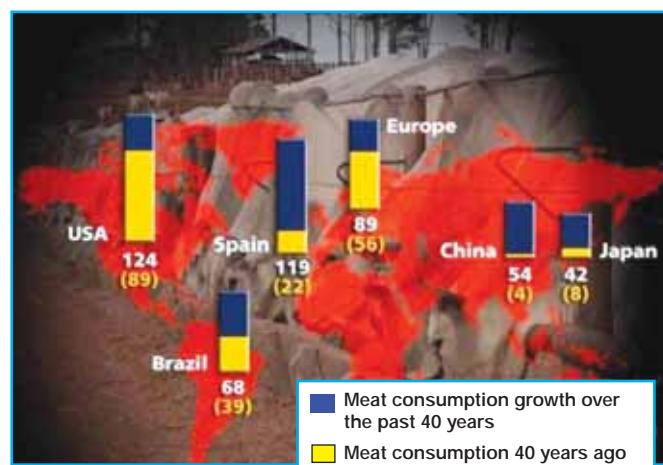
What we choose to consume largely determines what our farmers produce and what we import. In other words, food consumption acts as a multiplier of the impacts of production.

Furthermore, the way in which consumers store, prepare and dispose of food and packaging can significantly alter its environmental footprint. For example, refrigeration is estimated to be responsible for 3.0-3.5% of UK GHGs, including 42% of the emissions from energy use in supermarkets.¹¹ Domestic food preparation, storage and cooking account for around 10% of food-related GHG emissions.¹² Domestic and commercial food preparation together account for around 16% of these emissions.

For these reasons, energy efficient methods of storing and cooking food are likely to make a significant dent in overall emissions. All such impacts must be well understood, and, where possible, guided by the key actors in the supply chain, including farmers, agricultural service providers, processors and retailers.

Food consumption is projected to continue rising throughout the first half of this century. Figure 3 shows how consumption of meat products has increased across the world. In Europe, meat consumption has increased by 63% in the last 40 years. According to BPEX, meat consumption is growing more slowly in Europe than it is in developing countries, where growth is sharp.

Figure 3 Meat consumption per capita (Kg)¹³



The rising demand for food across the globe, and the factors that potentially limit our capacity to meet this demand, have raised concerns over food security at national and international levels. (Food security is discussed further in Chapter 8).

⁹ Their thesis is predicated on the following principals: current and projected rates of growth are unsustainable, given environmental limits; GDP is a hopeless indicator of human wellbeing, which is linked more to social equity, environmental quality and relative (not absolute) personal wealth; and developed countries have grown enough (in terms of GDP and resource use), and need to leave space for poor countries that need to grow; there are many ways to continue increasing human wellbeing in developed countries that do not allow for GDP growth; the notion of “decoupling” (whereby GDP growth continues alongside reductions in resource use) is invalid, because GDP growth is heavily dependent on the sale of material goods. See: *Prosperity Without Growth?* Sustainable Development Commission, 2009; *Economic Growth, Stability, Sustainability and Human Welfare: In the Last Chance Saloon*, presentation to SCPNet Annual Conference, Paul Ekins, 2009.

¹⁰ Mottram Hall, Cheshire, 2009.

¹¹ Garnett, 2008.

¹² Department for Business, Enterprise and Regulatory Reform (2005). *Regional Energy Consumption Statistics*. www.berr.gov.uk/energy/statistics/regional/index.html

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2.4 Ecosystem services

Nature provides essential resources to the system of production-consumption, including provisioning services (products such as meat, timber and fish) and regulation services, such as climate control, pollination, irrigation and flood regulation. According to the Millennium Ecosystem Assessment (MA), 60% of these “ecosystem services” are being degraded or used unsustainably, including 70% of provisioning and regulating ecosystem services (Figure 4).¹⁴

Because of the enormous quantities of food produced and consumed in the UK, even small changes in our food-related behaviour can have a powerful influence on climate change, water availability and quality, and biodiversity.

Figure 4 Changes in ecosystem services¹⁵

Balance sheet: Ecosystem services				
Provisioning services			Regulating services	
Food	crops	↑	Air quality regulation	↓
	livestock	↑	Climate regulation – global	↑
	capture fisheries	↓	Climate regulation – regional and local	↓
	aquaculture	↑	Water regulation	↓
	wild foods	↓	Water purification and waste treatment	↓
Fiber	timber	+/-	Disease regulation	+/-
	cotton, silk	+/-	Pest regulation	+/-
	wood fuel	↓	Natural hazard regulation	↓
Genetic resources			Cultural services	
Biochemicals, medicine			Spiritual and religious values	↓
Water	freshwater	↓	Aesthetic values	↓
			Recreation and ecotourism	↓

↑ globally enhanced

↓ globally degraded

The MA evaluated the global status of provisioning, regulating and cultural services. An upward arrow indicates that the condition of the service globally has been enhanced and a downwards arrow that it has been downgraded in the recent past.

Of all ecosystem services, a stable climate is perhaps the most important and the most threatened by human activities. There is now broad scientific consensus, official government policy, and political momentum in support of radical cuts to GHG emissions, both in the economy as a whole and in “high impact sectors”, notably food, transport and housing.

¹³ FAO, 2004, in *Global Warning! The Impact of Meat Production and Consumption on Climate Change*, presentation by R K Pachauri, London, 2008.

¹⁴ Sustainable Consumption Facts & Trends from a Business Perspective, WBCSD, 2008.

¹⁵ Millennium Ecosystem Assessment, UN, 2005.

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Ecosystem services *cont'd*

Policy makers, academics and non-governmental organisations are working – often in collaboration – to understand the environmental impacts of food production and consumption, and to conceive pathways towards meeting aggressive reduction targets. (WWF-UK is calling for food-related GHGs to fall by 70% by 2050, while the recently introduced Climate Act 2009 commits Britain to overall GHG reductions of 80% by that date). The pork industry, as a relatively high-impact part of a high-impact sector, is expected to do its part in averting temperature rises of above 2°C, which might cause dangerous and irreversible effects.

The link between our food and our weather is far more significant than most people realise. The consumption of food is responsible for around a fifth of the UK's GHGs; when land use change is taken into account, this rises to 30%.¹⁶ In the case of pig products, the majority of GHGs are in the form of carbon dioxide (CO₂) and arise predominantly at opposing ends of the food chain: in production, they come from growing and importing soya cake from Brazil and Argentina, where it is fed with fossil-based fertilisers and sometimes grown on land cleared from tropical rainforests; in consumption, they arise mainly from refrigeration and cooking. A relatively lower proportion arises from processing, transport (including refrigeration in transport) and retailing.

Though less carbon intensive than beef or lamb, pork production and consumption makes a significant contribution to climate change and other (often associated) environmental impacts, such as water quality and quantity. These impacts, in turn, affect the amount, types and quality of food available to us in our shops, gardens and restaurants.

2.5 Public policy

In his foreword to the Sustainable Development Commission's recent report, "Green, Healthy and Fair", Professor Tim Lang says: "For 60 years since the 1947 Agriculture Act, the overarching tenet of UK food policy has been to ensure that enough food is available, affordable and accessible. Today in the era of climate change, oil dependency, looming global water shortage, fish-stock crises, biodiversity and public health challenges, to aim purely for [this] would be hopelessly inadequate".¹⁷

Because of the complex and systemic nature of the food system, and because systemic approaches to food system management are relatively new, no government body has overall responsibility for managing food's environmental impacts. Instead, responsibility is spread across a range of government departments, and influenced by both national and European legislation. In the UK, food is mainly the responsibility of the Food Standards Agency (FSA) and, to a lesser extent, the Department of Health (DoH), while farming is mainly that of Defra. Responsibility for the related issue of climate change falls to the newly formed Department for Energy and Climate Change (DECC).

The UK Government's Food Industry Sustainability Strategy (FISS) challenged food producers and retailers (under pain of future regulation) to reduce CO₂ emissions by 20% by 2010, waste by 10-15% by 2010, and water consumption by 10-15% by 2020 (all against 1990 levels). However, there is little central co-ordination of this strategy, and it is, in large part, dependent upon the success of broader measures to reduce GHGs.

¹⁶ An assessment of greenhouse gas emissions from the UK food system and the scope for reduction by 2050. How low can we go?, Cranfield/Murphy-Bokern Konzepte/Ecometrica, 2009 (unpublished).

¹⁷ *Green Healthy and Fair*, Sustainable Development Commission, 2008.

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Nevertheless, systemic guidance was recently given by the Cabinet Office in its influential 2008 report, *Food Matters*,¹⁸ as part of its Foresight workstream. Furthermore, the government has recently launched a new Foresight Global Food and Farming Futures programme and is publishing an influential report on the major issues facing the food system in the UK. (These include all of the issues mentioned by Professor Lang). Defra is undertaking an exercise to produce a “Vision of a Sustainable Food System for the UK”, due in January 2010, following consultations with industry and the third sector. It has already completed, with Dairy UK and a range of partners in industry and the third sector, a Milk Roadmap¹⁹ setting out the key environmental impacts and mitigation strategies for the full value chain. A similar roadmap for beef is due to be launched in late 2009.

Recent announcements have also demonstrated the government’s commitment to reducing food impacts, especially on GHGs. New policies on the provision of hospital meals, and discussions over further improvements in procurement policies, suggest that the UK government would be receptive to well thought-out recommendations to address the environmental impacts of food (especially meat, and especially with relation to GHG mitigation).

Most recently, in July 2009, the UK Government published the Low Carbon Transition Plan. In this White Paper, the government sets out a comprehensive plan for reducing GHG emissions by 34% on 1990 levels (equivalent to 18% on 2008 levels) by 2020. As part of this plan, the farming, land and waste sectors would contribute about 4% of the overall cuts in GHG emissions between 2018 and 2022.

2.6 The role of BPEX

BPEX is a non-departmental public body (NDPB), mandated by Defra and funded entirely by industry. Defra has nominal control over its activities and uses it as a source of expert advice on the structure, dynamics and technologies involved in pork production. BPEX’s funding comes from pork farmers and processors, who pay a levy on each pig slaughtered. (Producers currently pay a levy of 85p per pig slaughtered; processors and exporters pay 20p per head).

Until 2008, the functions of BPEX – and of its parent body, the Agriculture and Horticulture Development Board (AHDB) – were carried out by the Meat and Livestock Commission (MLC), which was responsible not only for pork, but also for lamb and beef. The AHDB has responsibility for the three major types of livestock – cattle, sheep and pigs in England – as well as for horticulture, milk and potatoes in Great Britain, and cereals and oilseeds in the UK. However, it does not handle all of these food types in one contiguous body, as did the MLC; instead, it oversees a series of subsidiary boards, namely:

- HGCA: Cereals and oilseeds (UK);²⁰
- EBLEX: Beef and lamb (England only);²¹
- Horticultural Development Company: Horticulture (GB);²²
- DairyCo: Milk (GB);²³
- BPEX: Pigs (England only);²⁴ and
- Potato Council: Potatoes (GB)²⁵

¹⁸ *Food Matters*, Cabinet Office Strategy Unit, 2008.

¹⁹ *The Milk Roadmap*, Defra, 2008.

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The role of BPEX *cont'd*

The AHDB also owns a commercial organisation called Meat and Livestock Commercial Services Limited, which offers authentication services, advice, auditing and equipment to the meat and livestock industry.

The BPEX board comprises farmers, representatives of the three largest pork processors in the UK, and an independent, non-executive director, all of whom are appointed through a public process.²⁶ A representative from Defra plays a role in appointing these board directors.

An important element of BPEX's mandate is to position the UK pork industry favourably with regard to those of other countries with whom it competes, such as Denmark, France and Germany. Since BPEX's mandate covers only England, it is also technically in competition with producers in the rest of the UK. Whilst the AHDB and its constituent organisations do not participate in lobbying activities, most pig farmers are members the National Pig Association (NPA),²⁷ which does. Furthermore, BPEX and the NPA currently share a Chairman.

- In light of its mandates, structure, membership and sources of finance, BPEX has to position itself carefully as an impartial facilitator of economically and politically successful pork production in the England, whilst protecting the interests of English pork producers and consumers and following EU state aid rules.

The recommendations in this report take into account BPEX's mandate, constraints and capabilities. Currently, BPEX's stated focus is "to enhance the competitiveness, efficiency and profitability for English pig levy payers, and to drive demand for English pork and pig meat products in Britain and globally".²⁸ This report proposes that BPEX should begin to focus less on maximising production and more on assuring that pork production and consumption is met sustainably from domestic production. This might imply either a change in the balance of trade, or a reduction in overall domestic pork consumption.

²⁰ www.hgca.com

²¹ www.eblex.org.uk

²² www.hdc.org.uk

²³ www.dairyco.org.uk

²⁴ www.bpex.org.uk

²⁵ www.potato.org.uk

²⁶ Tulip is Danish owned, Vion Dutch owned and Cranswick British. Since this report focuses on the environment, it does not consider whether or not foreign representation on the BPEX board affects its ability to boost the competitiveness of domestic producers.

²⁷ www.npa-uk.org.uk

²⁸ www.bpex.org.uk

3 Agriculture, pigs and the environment

3.1 Summary of impacts

The production of pig meat causes a range of environmental impacts, including climate change, eutrophication, acidification, the use of abiotic resources, pesticide pollution to soil and water, and the use of land that could otherwise be used for other purposes (such as wilderness or growing vegetable food stuffs). Figure 5 shows how these issues relate to the different parts of the value chain.

Figure 5 Environmental impacts through the value chain ²⁹



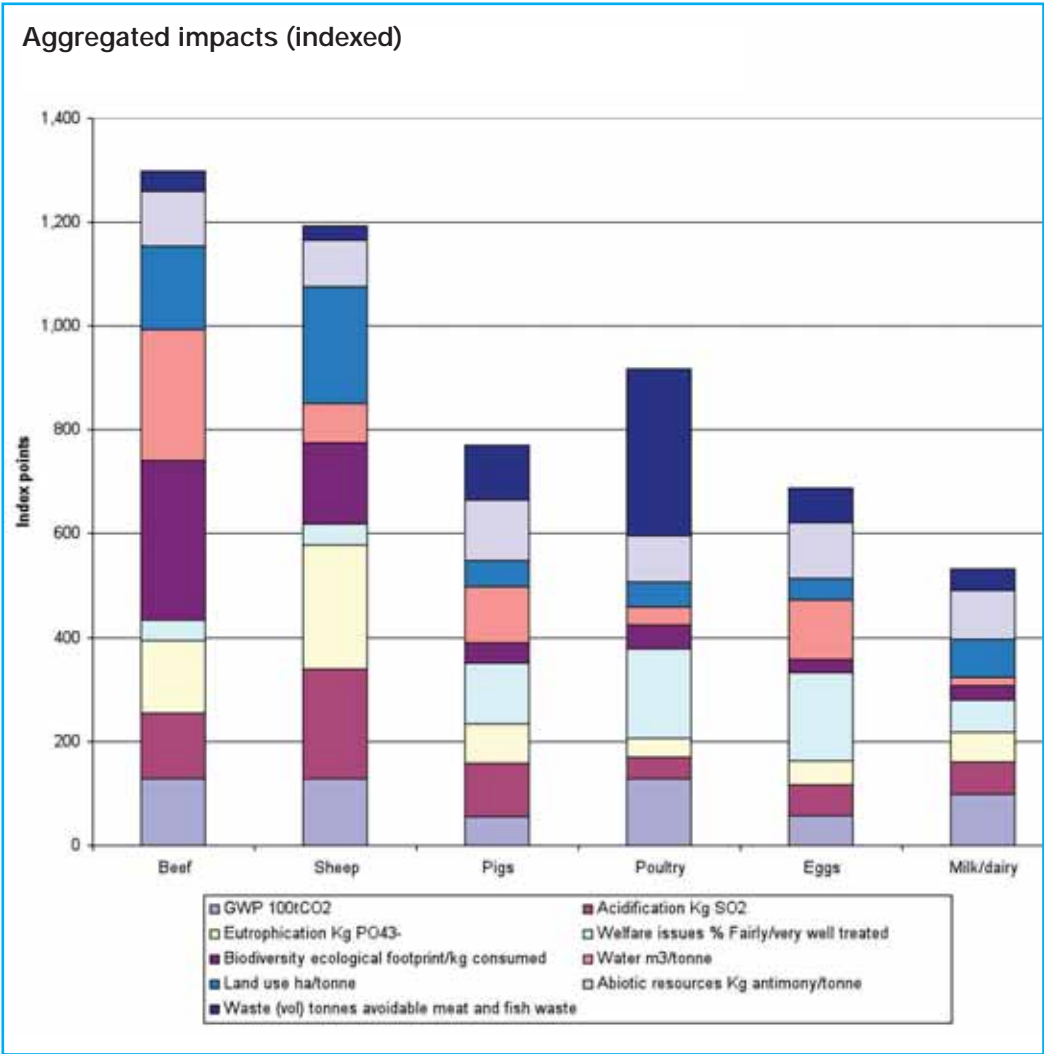
²⁹ Strategies for Reducing Red Meat and Dairy Consumption in the UK, Imperial College/WWF-UK, 2009.

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Summary of impacts *cont'd*

Figure 6 shows that beef and lamb are the most environmentally impactful animal products per unit of volume.³⁰ (The chart also shows perceived levels of animal welfare, even though some do not believe that welfare is an aspect of sustainability.)

Figure 6 *Impacts of livestock and animal products (per tonne consumed)*³¹



However, when consumption volumes are taken into account, dairy products and eggs have the greatest overall impacts; shares of UK consumption (by volume) are shown in Figure 7, while Figure 8 weights the indexed impact scores from Figure 6 according to these consumption volumes.

³⁰ Collated from various sources, as specified in the relevant sections of this report, by the author.

³¹ Ibid. The respective impacts of each food group have been converted to indices. This chart is useful for showing how each food group compares with the others across the range of environmental (and welfare) indicators, but not for assessing the absolute impacts of consumption. This is because the indicators for each impact differ in nature, and no view has been taken on whether one type of impact is better or worse than another.

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Figure 7 Share of UK consumption (by volume)

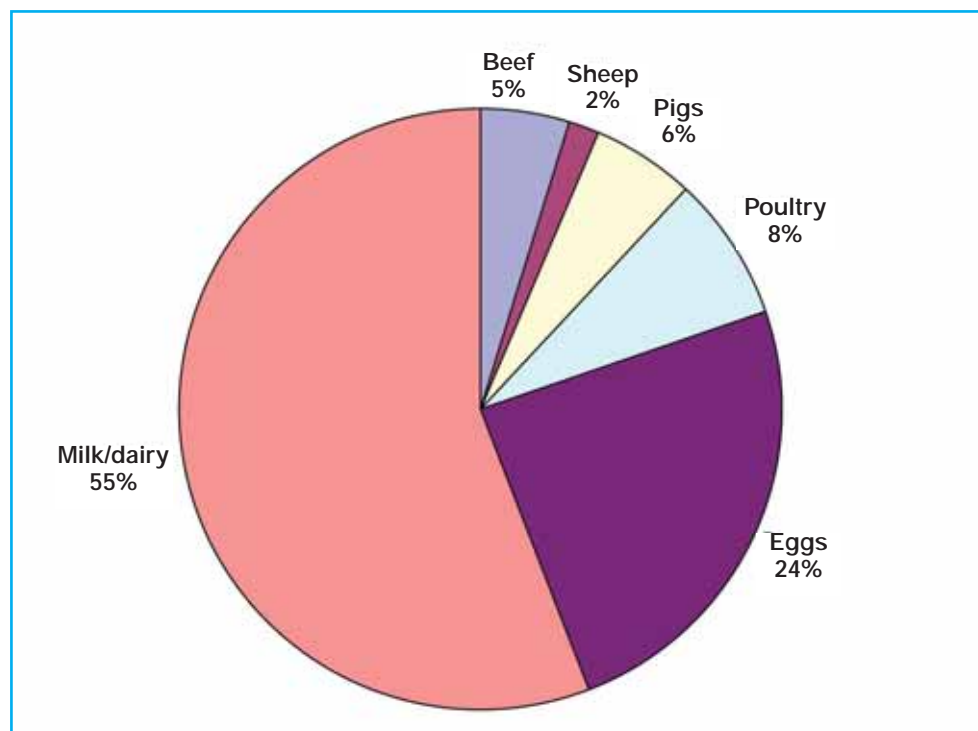
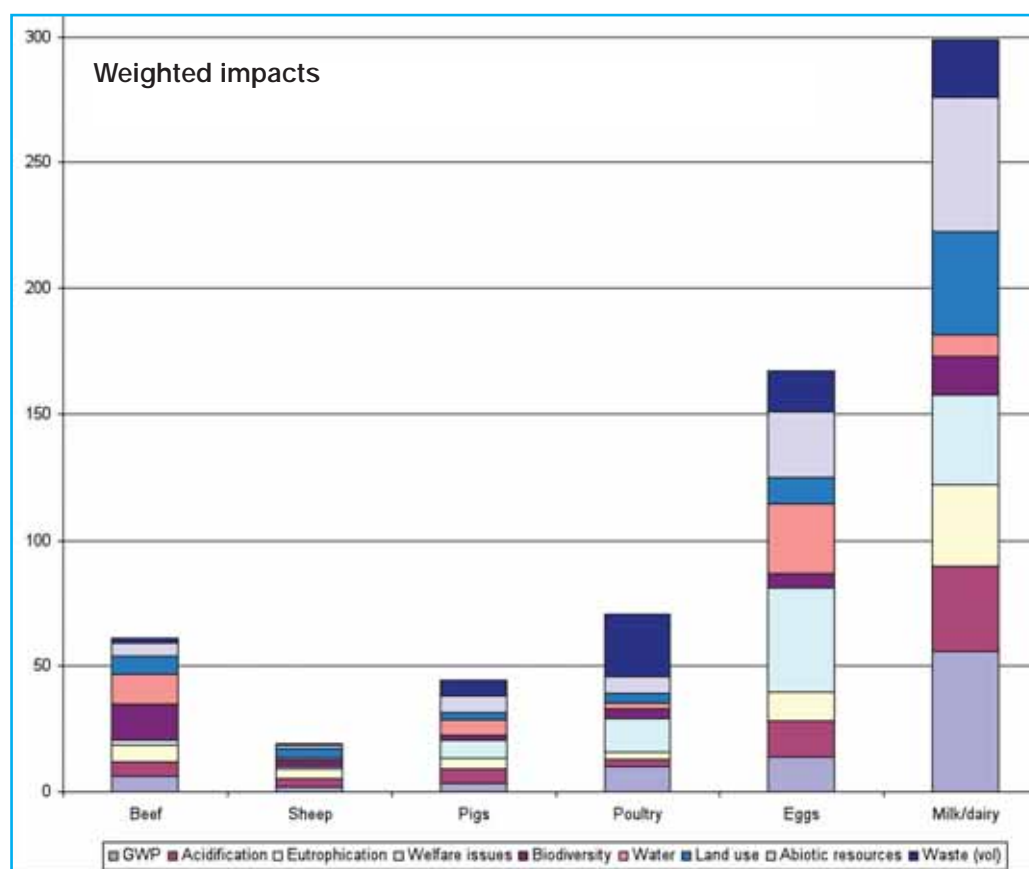


Figure 8 Overall impacts of livestock and animal products (adjusted for actual consumption volumes)³²



³² Ibid.

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Summary of impacts *cont'd***Table 1** *The environmental demands and impacts of meat and dairy products, with consumption volumes*³³

		Beef	Sheep	Pigs	Poultry	Eggs	Milk
GWP	100tCO ₂	7	7	3	7	3.1	5
Acidification	Kg SO ₂	296	495	241	96	140	143
Eutrophication	Kg PO ₄₃	121	207	66	32	40	50
Welfare issues	% fairly/very well treated	16	16	49	71	71	26
Biodiversity	ecological footprint/kg consumed	1570	800	200	240	120	140
Water	m ³ /tonne	12131	3634	5146	1704	5551	746
Land use	ha/tonne	2	3	1	1	0.54	1
Abiotic resources	Kg antimony/tonne	34	29	38	29	35	31
Waste (vol)	tonnes avoidable meat & fish waste	37800	27100	102200	312400	64800	40300
Total index points Consumption	tonnes, 2008	1,121,295	380,453	1,380,540	1,840,559	5,800,000	13,375,041

One unit of pig meat consumption contributes less to climate change than an equivalent amount of beef or lamb, so the climate effects of any given reduction in pork consumption (or improvement in production efficiency) will be lower than equivalent volume reductions (or efficiency improvements) in beef or lamb (though higher than for chicken). However, pork accounts for a higher proportion of the UK diet than beef or lamb (though, again, not chicken), so campaigners might argue that there is a greater opportunity for consumers to reduce their intake of pork than beef or lamb, without significant changes to the make-up of their overall diet.

Furthermore, if UK consumers are to eat less meat for environmental purposes, there may be more room, both literally and metaphorically, to concentrate on pigs than ruminants. This is because pigs are generally reared on more fertile land than sheep and some beef cattle. Low grade land that can be used for the grazing of sheep and cows is often unsuitable for other types of food production, whereas pigs are reared primarily on Grade 3 land, which can be used for a variety of other agricultural purposes. These include the rearing of chickens and vegetable crops, both of which are less carbon intensive. Pig production, therefore, faces more "competition" for environmental resources than ruminant production. Chickens and pigs both convert soya protein into animal protein for human consumption. In this respect at least, chickens are the more efficient.

Various authors have calculated the feed energy required to produce a calorie of animal protein. This "feed conversion efficiency" has a major bearing on the emission of GHGs, since losses of nutritional energy through the production chain – from plant to animal nutrients – mean that more GHGs are emitted for a given quantity of nutritional output. For pigs reared in conventional farm systems, feed efficiency is 2.75. (In other words, 2.75 Kg of feed is used to produce 1 Kg of pork). This is lower than with broiler chickens (at approximately 2.0) and eggs (approximately 1.8). The feed conversion ratio for beef is harder to calculate, but is estimated to vary between 5 and 10.³⁴

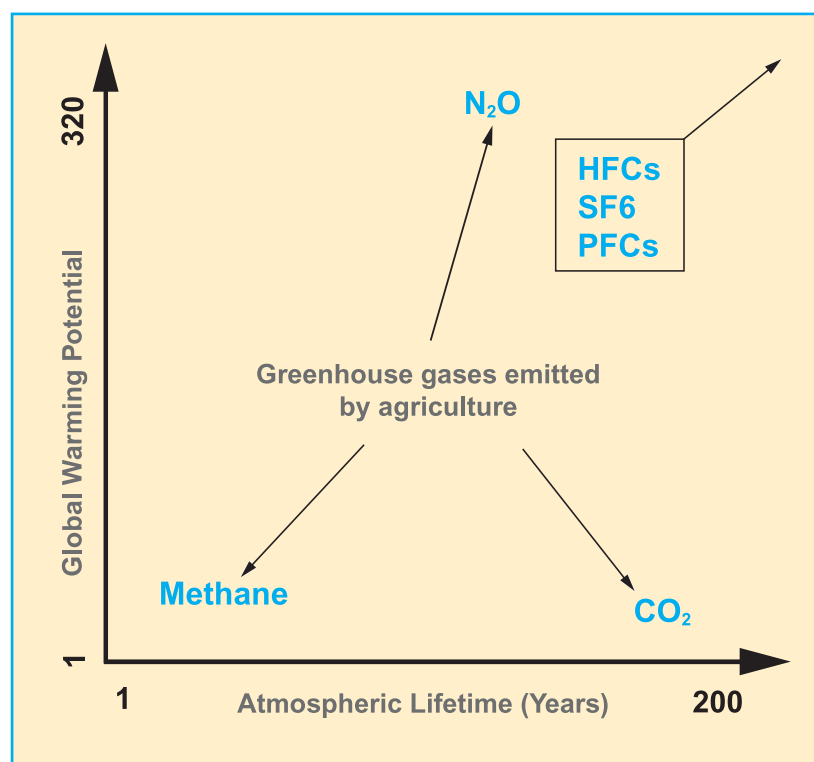
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3.2 Climate change

3.2.1 Global context

Each year, humans are responsible for releasing gases into the atmosphere that trap too much of the Earth's radiated heat and cause the atmosphere (and Earth) to warm up. The majority of our GHG emissions are in the form of carbon dioxide (CO₂) – humans cause the amount of CO₂ in the atmosphere to rise by between 4.5 and 6.5 billion tonnes each year. However, other gases, particularly methane (CH₄) and nitrous oxide (N₂O) from agriculture, are also released (see part b of Figure 10). The global warming potential (GWP) of these gases can be much higher per tonne than it is for CO₂, though the effects may not last as long. As Figure 9 shows, methane is over twenty times more powerful as a greenhouse gas than carbon dioxide, but does not persist as long in the atmosphere. Nitrous oxide is hundreds of times more powerful than either methane or carbon dioxide, and stays in the atmosphere for 120 years. Capping emissions of nitrous oxide, therefore, is as important as capping those of CO₂.³⁴

Figure 9 Global warming potentials and persistency of the main greenhouse gases



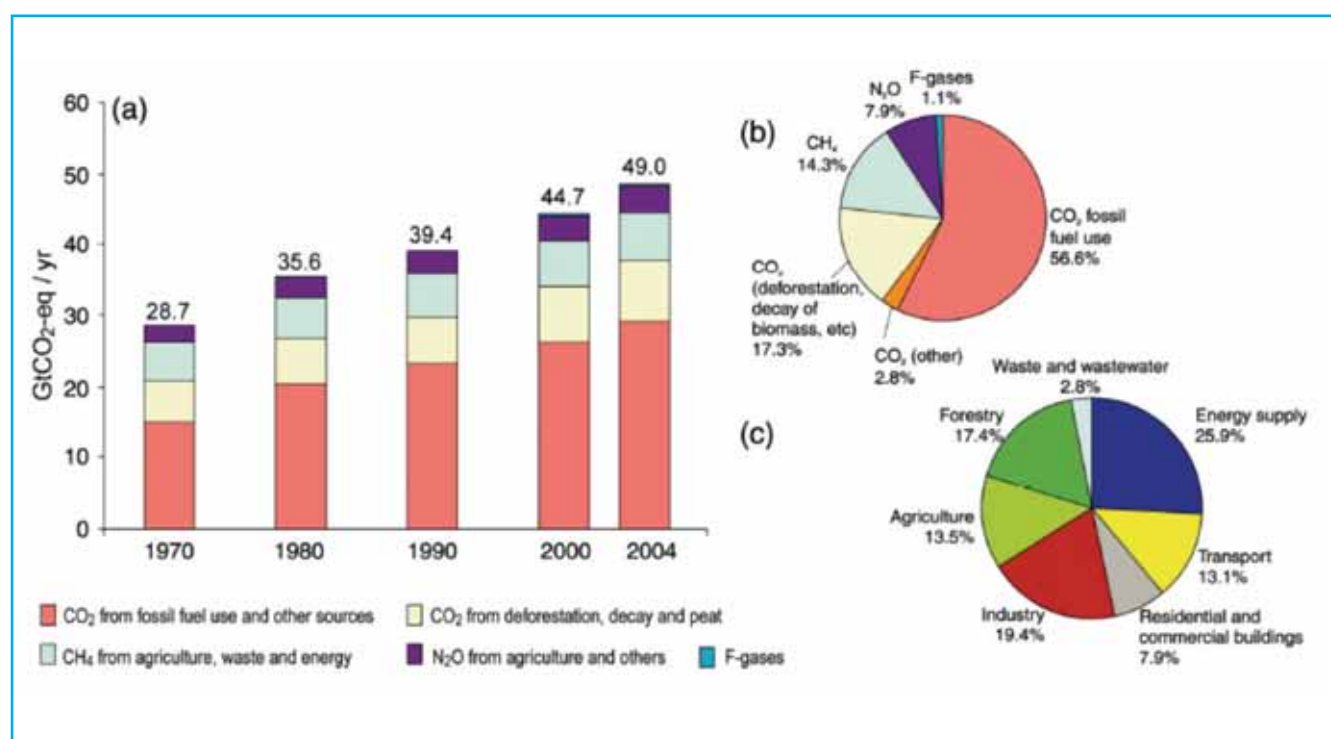
³³ IPCC, 2008.

³⁴ *Cooking up a Storm: Food GHGs and our changing climate*, Garnett, 2008.

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Climate change *cont'd*

Figure 10 (a) Global annual emissions of anthropogenic GHGs 1970-2004 (b) Share of different anthropogenic GHGs in total emissions in 2004 (CO_2 -eq.) (c) Share of different sectors in total anthropogenic GHG emissions in 2004 in terms of CO_2 -eq. (Forestry includes deforestation).³⁵

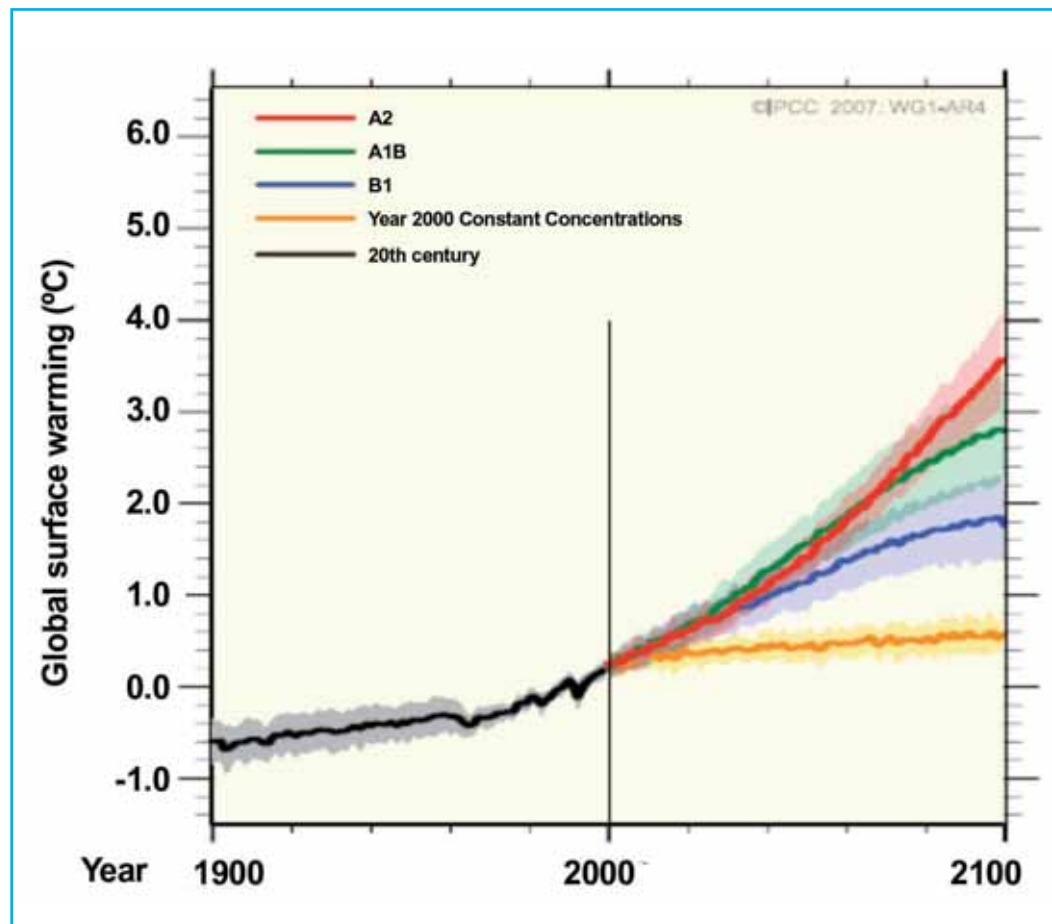


If the average temperature of the Earth's atmosphere rises by 2°C this century, as considered likely by the IPCC (Figure 11), then sea levels could rise by over a metre, threatening parts of East Anglia and other low lying areas that are conducive both to agriculture and human habitation. Higher temperature rises could be catastrophic. In the IPCC's worst case scenario, sea levels could rise by 6.4m by 2100, wiping out vast areas of arable land and the densest parts of most of the world's major cities. Low-lying areas, including Bangladesh, Florida, the Maldives and the Netherlands would be lost. In Britain, large areas of the Norfolk Broads and the Thames Estuary would disappear.³⁶ Major cities, including London, Hull and Portsmouth would need new flood defences. Mass migration would be required. Less land would be available to feed, water and house the same number of people, perhaps triggering conflicts over water and other scarce resources. UK producers may also be expected to feed large numbers of environmental refugees from areas that have become uninhabitable (such as those areas of the world that are currently short of water).

³⁵ Intergovernmental Panel on Climate Change Fourth Assessment Report: Summary for Policy Makers, IPCC, 2007. For an explanation of the scenarios, see www.ipcc.org

³⁶ www.guardian.co.uk/science/2009/mar/08/climate-change-flooding

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Figure 11 Predicted surface warming for a range of global temperature scenarios³⁷

The IPCC's lower estimate of a 60cm sea level rise is probably too low, because it contains very little input from melting ice sheets in Antarctica and Greenland, which is progressing much faster than expected.³⁸

Futhermore, we may enter a positive feedback cycle, in which melting sea ice and vast areas of permafrost – normally considered the symptoms of global warming – themselves become drivers of climate change.

³⁷ Intergovernmental Panel on Climate Change Fourth Assessment Report: Summary for Policy Makers, IPCC, 2007. For an explanation of the scenarios, see www.ipcc.org

³⁸ Sebastian H. Mernild, Glen E. Liston, Christopher A. Hiemstra, Konrad Steffen, Edward Hanna, Jens H. Christensen. Greenland Ice Sheet surface mass-balance modelling and freshwater flux for 2007, and in a 1995-2007 perspective. *Hydrological Processes*, 2009. Cited at www.sciencedaily.com/releases/2009/06/090612092741.htm

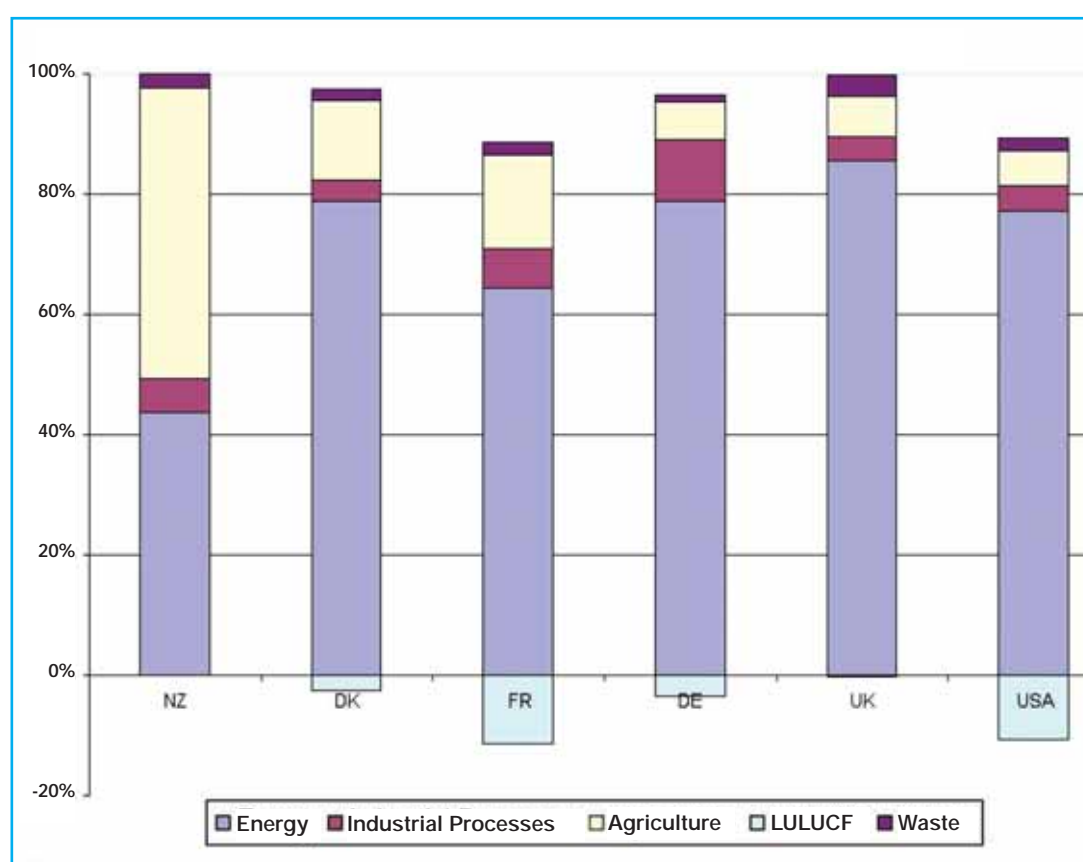
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3.2.2 Causes

Human-made GHGs come mainly from three economic systems: food, transport and housing. The charts in the previous section show how GHG emissions from agriculture compare with those of other sectors. This section features further comparisons, beginning with how GHG emissions vary by country (Figure 12).³⁹ It should be noted that the GHG emission figures used in Figures 12-15 exclude the effects of deforestation and other types of land use change. When land use change is taken into account, the GHG intensity of pig meat would rise, because of the fact that some soya is grown on land cleared from rainforest; for food overall, the inclusion of land use change takes GHG contributions up by a third, from 20% to 30%. (A forthcoming study for WWF-UK by the Food Climate Research Network⁴⁰ will provide more details).

Livestock accounts for around 7% of UK GHG emissions⁴¹ (excluding land use change). Meat and dairy is responsible for around 28% of the GHGs attributable to the food sector.

Figure 12 Net GHG emissions by sector and country⁴²



³⁹ It should be noted that data reported to the UN Convention on Climate Change (from which these data are sourced) are politically sensitive and vary from country to country; this has been identified as a weakness in the structure of the Kyoto Protocol, and a potential area of improvement in the forthcoming climate negotiations in Copenhagen.

⁴⁰ An assessment of the greenhouse gas emissions from the UK food system and the scope for reduction by 2050: How Low Can We Go? Audsley et al., awaiting publication.

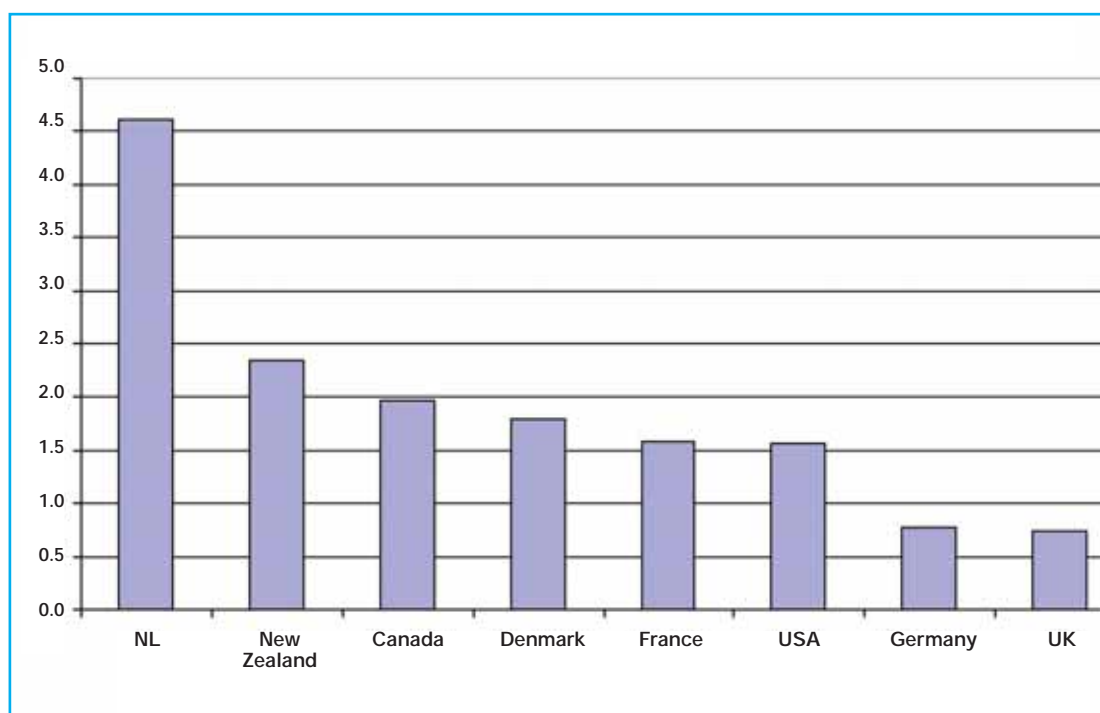
⁴¹ Defra Project AC204 Report, 2008.

⁴² UNFCCC database at unfccc.int/ghg_data/ghg_data_unfccc/ghg_profiles/items/4625.php

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The agricultural sectors in New Zealand, Denmark and France all account for a significantly higher proportion of total GHG emissions than they do in the UK. However, France and the USA report higher rates of carbon sequestration (the removal of carbon from the atmosphere) by land use, land use change and forestry. (This may be because they comprise a greater proportion of wilderness and forested land). The UK has relatively low agriculture-related GHG emissions per capita, especially in comparison with the Netherlands and New Zealand (Figure 13).

Figure 13 Agricultural GHG emissions per capita ⁴³



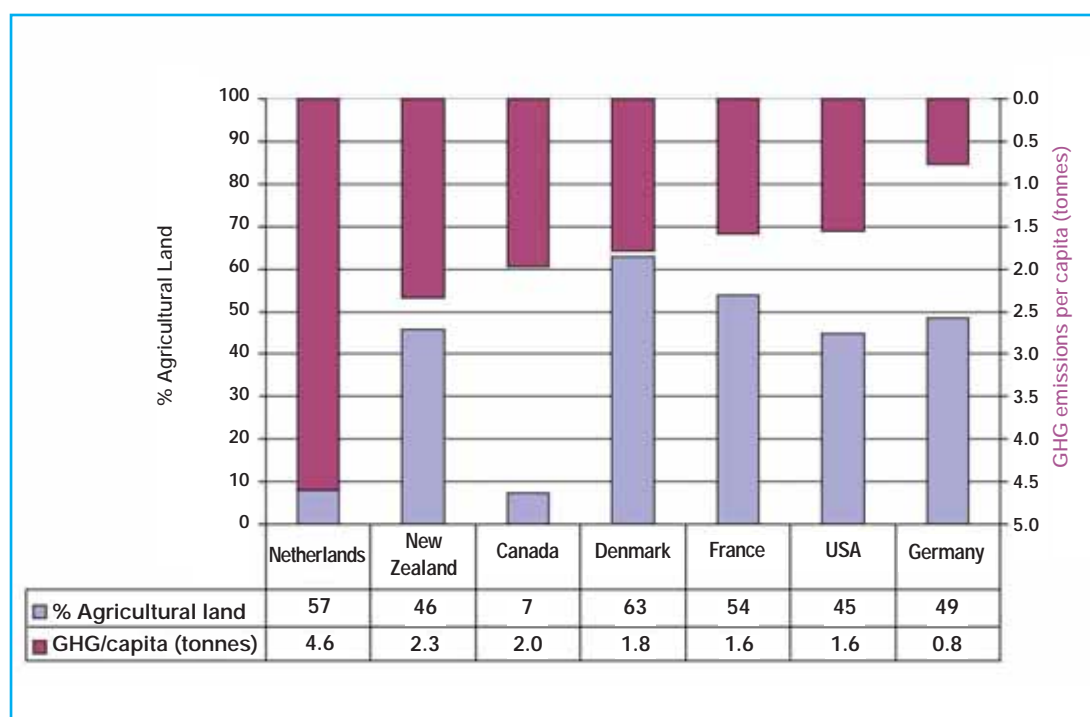
On the whole, and perhaps unexpectedly, countries with a high proportion of land given over to agriculture (such as the UK) tend to have lower agricultural GHG emissions per capita (Figure 14).

⁴³ UNFCCC database at unfccc.int/ghg_data/ghg_data_unfccc/ghg_profiles/items/4625.php

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Causes *cont'd*

Figure 14 Agricultural GHG emissions/capita (tonnes), compared with % of total land given over to agriculture ⁴⁴

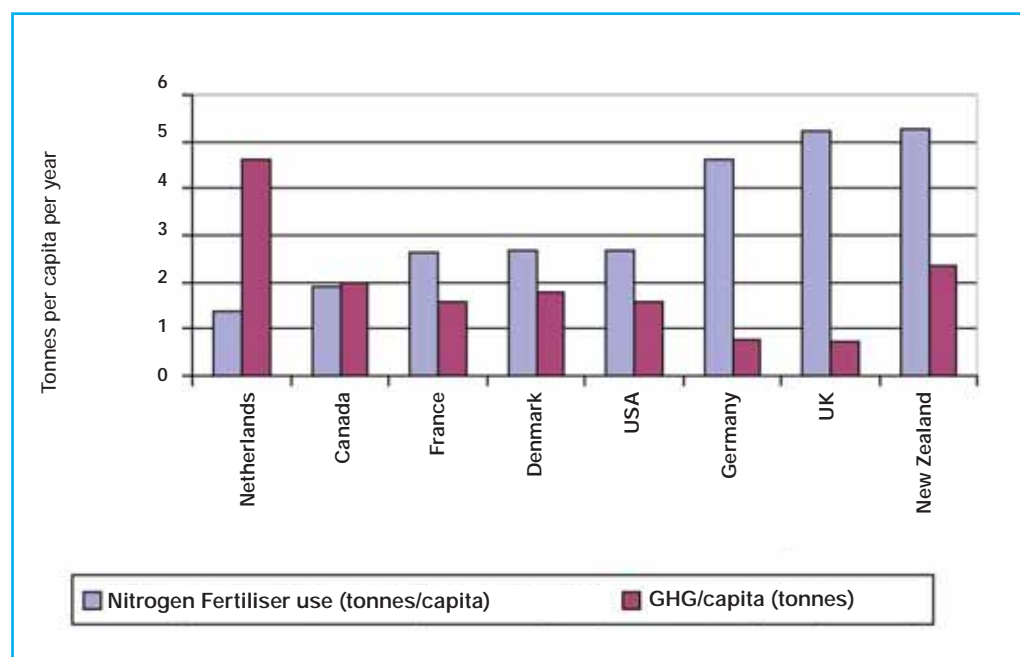


Variations may be explained by: the type of product being produced (a relatively higher proportion of meat production to human food crop production may increase per capita agricultural GHGs, and vice versa); net imports and exports (of both products and the emissions associated with their consumption); and agricultural productivity.

With the exception of the Netherlands and New Zealand, higher per capita rates of nitrogen fertiliser use seem to be related to lower per capita GHG emissions from agriculture (Figure 15). Notable exceptions are: The Netherlands, which has a large pig industry but imports a large proportion of its feed (effectively “offshoring” its emissions); New Zealand, which has a large grazing population, so applies fertiliser on grassland; and Canada, which is relatively sparsely populated. Weather patterns and choice of livestock also affect this ratio.

⁴⁴ Ibid.

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Figure 15 The relationship between nitrogen fertiliser use and GHGs/capita ⁴⁵

3.2.3 Manure

Global methane emissions from decomposition of manure have been estimated at just over 10 million tonnes, ⁴⁶ or around 4% of global anthropogenic methane emissions (Table 2). This is much lower than methane emissions from enteric fermentation, but much higher than those from burning residues, and equivalent to those from rice growing. Pigs contribute the largest share, followed by dairy cattle.

Figures are not available for China and India, but, according to LEAD, would not be far behind those of the US and the EU – two of the highest methane emitters. China has the largest manure-related methane emissions in the world, mainly from pigs. Globally, pig manure represents almost half of all manure-related emissions.

⁴⁵ Source data from FAOSTAT.org and UNFCC database at unfccc.int/ghg_data/ghg_data_unfccc/ghg_profiles/items/4625.php

⁴⁶ Livestock's Long Shadow, LEAD/FAO, 2006.

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Table 2 Global methane emissions from manure management, 2004 ⁴⁷

Region/country	Emissions (million tonnes CH ₄ per year by source)						Total
	Dairy cattle	Other cattle	Buffalo	Sheep & goats	Pigs	Poultry	
Sub-Saharan Africa	0.10	0.32	0.00	0.08	0.03	0.04	0.57
Asia *	0.31	0.08	0.09	0.03	0.50	0.13	1.14
India	0.20	0.34	0.19	0.04	0.17	0.01	0.95
China	0.08	0.11	0.05	0.05	3.43	0.14	3.84
Central & South America	0.10	0.36	0.00	0.02	0.74	0.19	1.41
West Asia & North Africa	0.06	0.09	0.01	0.05	0.00	0.11	0.32
North America	0.52	1.05	0.00	0.00	1.65	0.16	3.39
Western Europe	1.16	1.29	0.00	0.02	1.52	0.09	4.08
Oceania & Japan	0.08	0.11	0.00	0.03	0.10	0.03	0.35
Eastern Europe & CIS	0.46	0.65	0.00	0.01	0.19	0.06	1.38
Other developed	0.01	0.03	0.00	0.01	0.04	0.02	0.11
Global Total	3.08	4.41	0.34	0.34	8.38	0.97	17.52
Livestock Production System							
Grazing	0.15	0.50	0.00	0.12	0.00	0.00	0.77
Mixed	2.93	3.89	0.34	0.23	4.58	0.31	12.27
Industrial	0.00	0.02	0.00	0.00	3.80	0.67	4.48
* Excludes China & India							
Source: See Annex 3.3. own calculations							

3.2.4 Relationships between meat and dairy products, production and consumption

Livestock farming for the production of meat, milk and eggs (with wool, leather and other products also produced) is an important source of greenhouse gases (GHGs). Livestock production accounts for around 7% of the UK's total GHG emissions. ⁴⁸ In this respect, it is second only to energy production (including power generation and transport). A very high proportion (almost three quarters) of the UK is given over to agricultural land (Figure 16), perhaps because of our high urban population density, which forces us to produce more calories from the remaining land.

The impacts described opposite do not take into account the considerable impacts of consumption, arising from the energy required to store and cook food in the home, and the energy embedded in the food and packaging that is wasted.

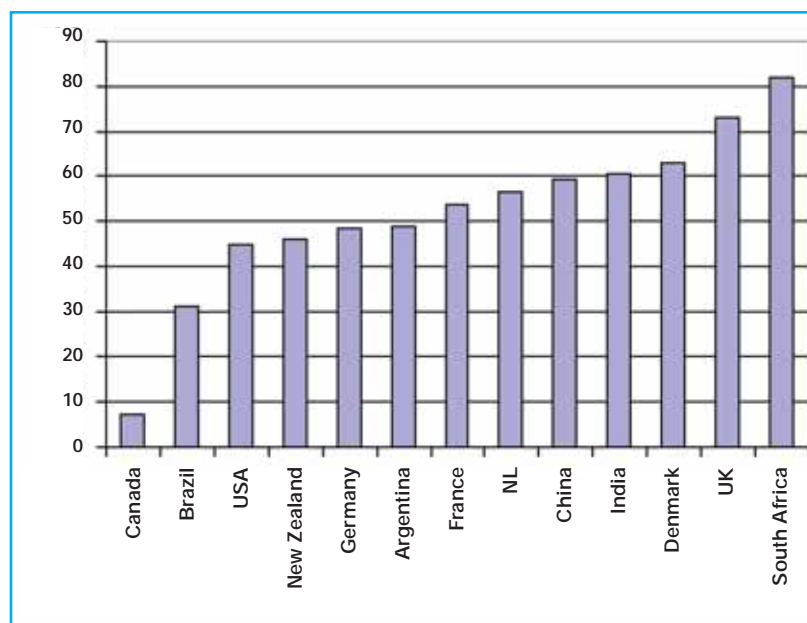
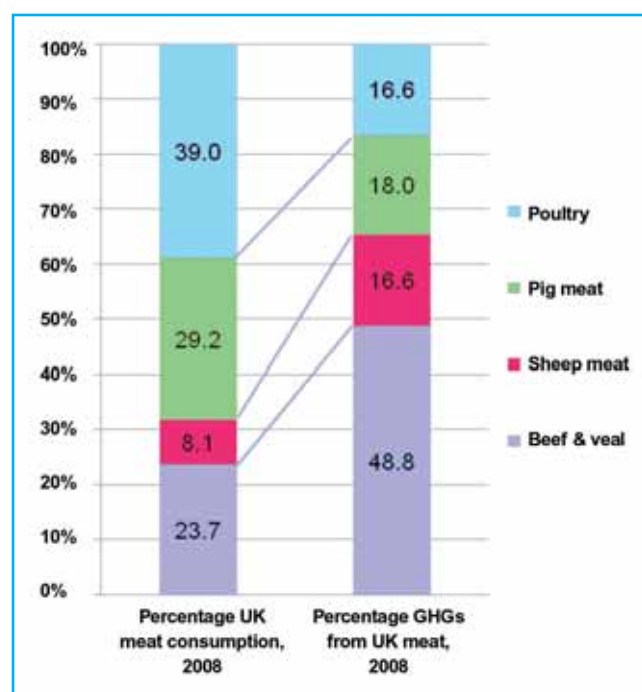
Meat and dairy is responsible for around 28% ⁴⁹ of the GHGs attributable to the food sector (or 44 megatonnes of CO₂-equivalent, out of a total of 157 MtCO₂e). 18% of these meat and dairy-related GHG emissions come from pork - slightly more than from both poultry and sheep meat, and far less than from beef and veal, which account for a half. Figure 17 shows the relative shares of consumption for animal products in the UK, ⁵⁰ compared with their relative contributions to GHG emissions. Pig meat accounts for 29.2% of total UK meat consumption, but 18% of meat-related GHG emissions.

⁴⁷ Ibid.

⁴⁸ Defra Project AC204 Report, 2008.

⁴⁹ Ibid.

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Figure 16 % of total land area given over to agriculture, by country, 2005⁵¹Figure 17 Meat consumption and its related greenhouse gas emissions for 2008⁵²

⁵⁰ In terms of pig numbers, the UK pig sector declined by over 17 per cent between 2001 and 2007, and is expected to decline by 1 per cent between 2004 and 2015 (ADAS, 2008; it is not clear whether this decline takes into account recent declines). The Institute for European Environmental Policy attributes this decline to a number of economic factors acting over the longer term, including: competition from countries such as Denmark, the Netherlands, Germany and France; the introduction of relatively costly EU welfare standards in the UK earlier than in other Member States; and the ban on the use of meat and bone meal (as a result of the BSE crisis), which required other more expensive sources of protein to be sourced, including soya.

⁵¹ FAOSTAT.org

⁵² Strategies for Reducing Red Meat and Dairy Consumption in the UK, Imperial College/WWF-UK, 2009.

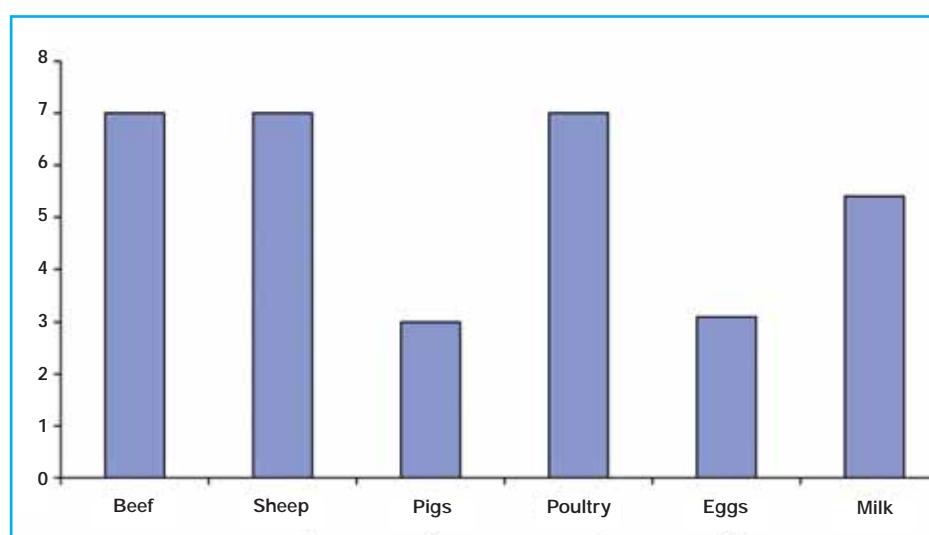
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Relationships between meat and dairy products, production and consumption *cont'd*

The majority of the GWP of meat and dairy is the result of methane emissions by ruminants (mainly in the form of burps). This is not the case for pigs, which produce less methane, and whose primary contributions to climate change are in the form of nitrous oxide (NO₂) from the use of fertilisers to grow feed, and carbon dioxide (CO₂) emitted by the use of fossil fuels in transport, processing, retail and cooking.

The Global Warming Potential (GWP)⁵³ of pig meat during production is 3.7, compared with 7 for both beef and lamb, 5 for dairy, 3.1 for eggs and 2.9 for poultry (Figure 18).

Figure 18 Global Warming Potential (GWP) per tonne produced



Most fruit and vegetables have considerably lower GWPs, even when grown in greenhouses or imported from abroad.⁵⁴

3.2.5 Policy context

The UK government has been a world leader in calling for GHG reductions: it has introduced the Renewables Obligation, which requires licensed electricity suppliers to source a specific and annually increasing percentage of the electricity they supply from renewable sources; it has introduced Climate Change Agreements (CCAs), which offer companies an 80% discount on the Climate Change Levy, in return for reducing their CO₂ emissions; and it recently became the first country to commit to mandatory (and significant) GHG reduction targets, under the Climate Act, 2009.

⁵³ GWP is an index of the importance of a factor (in this case, pork production) as a potential cause of climate change. It is a measure of "radiative forcing" - the ability to alter the balance of incoming and outgoing energy in the Earth-atmosphere system. Positive forcing tends to warm the surface of the Earth, while negative forcing tends to cool it ... Radiative forcing values are for changes relative to a pre-industrial background level of greenhouse gases in 1750, expressed in Watts per square metre (W m⁻²). (IPCC).

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The Climate Act is intended to “create a new approach to managing and responding to climate change in the UK through: setting ambitious targets; taking powers to help achieve them; strengthening the institutional framework, enhancing the UK’s ability to adapt to the impact of climate change; and establishing clear and regular accountability to the UK, Parliament and devolved legislatures”.⁵⁴ Here are those of its key provisions that are relevant to the pork industry:

- **Legally binding targets:** GHG emission reductions of at least 80% by 2050, and reductions in CO₂ emissions of at least 26% by 2020, against a 1990 baseline. (The 2020 target will be reviewed soon after Royal Assent to reflect the move to all greenhouse gases and the increase in the 2050 target to 80%. This may change further as a result of whatever deal is done in Copenhagen this December)
- **A carbon budgeting system** that caps emissions over five year periods. The first three carbon budgets will run from 2008-12, 2013-17 and 2018-22
- The creation of the **Committee on Climate Change (CCC)**, a new independent, expert body to advise Government on the level of carbon budgets and where cost effective savings could be made. The Committee will submit annual reports to Parliament on the UK’s progress towards targets and budgets to which the Government must respond, thereby ensuring transparency and accountability on an annual basis
- The inclusion of **international aviation and shipping emissions** by the end of 2012. Projected emissions from international aviation and shipping (including those arising from the transportation of pork products) must be taken into account in making decisions on carbon budgets
- Use of **International credits**. The Government is required to “have regard to the need for UK domestic action on climate change” when considering how to meet the UK’s targets and carbon budgets. The CCC has a duty to advise on the appropriate balance between action at domestic, European and international levels, for each carbon budget. The Government also amended the Bill in its final stages to require a limit to be set on the purchase of credits for each budgetary period
- Further measures on **biofuels**, financial incentive schemes in England for **household waste**, and powers to require a minimum charge for single-use **carrier bags** (excluding Scotland)
- The Government must report at least every five years on the risks to the UK of climate change, and publish a programme setting out how the UK will **adapt** to unavoidable climatic changes. This programme will be the responsibility of a new **Sub-Committee on Adaptation**
- A requirement for the Government to issue guidance on the way **companies should report their GHGs**, and to use powers under the Companies Act to make such reporting mandatory
- New powers to support the creation of a **Community Energy Savings Programme**, by extending the existing Carbon Emissions Reduction Target scheme to electricity generators (including those who use anaerobic digestion).

The Government has had CCAs in place with the red meat processing⁵⁵ and dairy sectors in 2001, and retailers are aware that they will be included in the upcoming Carbon Reduction Commitment (CRC), but

⁵⁴ www.defra.gov.uk/environment/climatechange/uk/legislation/

⁵⁵ Umbrella Climate Change Agreement for the Meat Processing Sector, 2001.

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Policy context *cont'd*

they do not currently include non-CO₂ greenhouse gases; these gases – notably methane and NO₂ – are likely to be incorporated in future agreements. The pig production sector has a fully functioning CCA arrangement in place. According to BPEX, producers participating in this CCA have simultaneously cut their energy consumption and increased production over a ten year period. Pork producers are likely to be affected by measures to encourage anaerobic digestion of food and farm wastes. Greater levels of anaerobic digestion – especially in rural areas – will increase supplies of renewable energy and carbon-efficient fertiliser for use on farms and in processing facilities.

3.2.5.1 *Offsetting, emissions trading and biofuels*

The principal mechanism for restricting the GHG emissions of business is the EU Emissions Trading Scheme (ETS), a cap-and-trade system that targets intensive energy users, including large food companies. While many large companies participate in this scheme, it has been widely criticised for its perceived over-allocation of “free permits”. As a result of this form of over-supply, the price for ETS is around £9.00/tonne of CO₂ equivalent,⁵⁶ whereas there is an emerging consensus that it needs to be between £40 and £90 per tonne. (This consensus is not restricted to academics and NGOs; the chairman of Shell UK recently supported this view on Radio 4’s Today programme).

The next Phase of the ETS will be more stringent; emerging policies and targets on biofuels will indirectly affect the food system. For example, there are likely to be cuts in the proportion of transport fuel that must be made up of biofuels, because these biofuels have been accused of cannibalising the carbon emissions of food crops, driving up food prices, and threatening food security. By 2020, the proportion of biofuels in transport fuels is likely to be 6%, rather than the current target of 10%. (The remaining 4% will come from other renewable sources).⁵⁷ Many commentators, including the Food Climate Network (FCRN), Searchinger Scienc, Friends of the Earth and Biofuels Watch believe that biofuels may increase overall carbon emissions (compared with pure fossil fuels) by prompting the conversion of forest to arable cropping; further research is required into this contentious question.

Carbon offsetting schemes can help to counter these effects. These schemes have been made possible by the Kyoto Protocol’s Clean Development Mechanism (CDM), which enables high-emission countries (otherwise known as “Annex 1” countries, such as the UK) to offset some of their own emissions by investing in renewable energy schemes or green projects in developing countries.

However, the CDM has come in for heavy criticism, for three principal reasons: firstly, it is hard to prove that these “green” schemes would not have progressed even without help from the CDM (and easy to claim, without much substantiation, that they would not have done); secondly, there is evidence that some schemes are fraudulent and/or double counted in the overall allocation; finally, carbon offsets are, both literally and, some argue, psychologically, a license to pollute, whereas developed nations need to reduce their direct carbon emissions by 80% by 2050.⁵⁸ It has also been claimed that CDMs do not necessarily benefit people in the poorest parts of the world. (There are many CDM projects in India and China, but very few in sub-Saharan Africa).

⁵⁶ As at 8 June, 2009.

⁵⁷ *Cooking Up a Storm*, FCRN, 2008

⁵⁸ For more on the “rebound effect”, see, for example, Sustainable Consumption. Note, also, that the Committee on Climate Change (CCC) has recently warned that UK carbon emissions must be cut by 90% by 2050 to allow for aviation.
www.channel4.com/news/articles/science_technology/calls_for_cap_on_aviation_emissions+/3337902

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One of the government's leading advisers on food-related carbon emissions reports that "there are very few agricultural CDM projects on the CDM register. Those there are tend to focus on the generation of energy (including [anaerobic digestion]) from animal waste, sewage, or biomass." ⁵⁹

To the author's knowledge, there are no international policies focusing directly on food-related GHG emissions. However, the forthcoming climate summit in Copenhagen may well spawn initiatives that do so, as well as affecting the broader market in significant ways (such as the creation of a globally regulated carbon market). Furthermore, international trade policies and agreements, negotiated through global trade rounds, are likely to take greater account of sustainability criteria, especially climate change, but also water, biodiversity and social issues.

3.2.5.2 *The Common Agricultural Policy*

The EU's Common Agricultural Policy (CAP) once had a powerful influence over patterns of production, because it made payments to farmers. However, payments were decoupled from production levels in 2005, and the CAP has begun taking into account environmental considerations. It is under pressure to place greater emphasis on "sustainable agriculture" in future. For example, WWF-UK ⁶⁰ recently called for the CAP to be replaced by a new "Common Environment and Rural Policy" ("CERP"), based on the principal of "public payment for public good" – "public good" comprising not only the provision of food, but also biodiversity, safe drinking water and a stable climate. This new CERP, argues WWF, would encourage "sustainable land management and rural development". (As yet, however, CAP does not include a specific provision for climate change). ⁶¹

3.2.6 Mitigation

3.2.6.1 *Options for producers*

Since a large proportion of GHG emissions arise before our food reaches the shop, there is a need to make pork production and food processing less "carbon intensive". This can most effectively be achieved by: ⁶²

- Reducing the proportion of soya in pig feed
- Increasing productivity in feed crop agriculture and livestock production (whilst avoiding negative implications for animal welfare)
- Improving diets for livestock to reduce enteric fermentation
- Improving manure management
- Generating and using biogas from anaerobic digestion ⁶³
- Reducing waste throughout the lifecycle.

⁵⁹ Tara Garnett, Resolve Centre, Surrey University, 2009.

⁶⁰ WWF-UK Position Statement on Food, WWF-UK, 2009.

⁶¹ Strategies for Reducing Red Meat and Dairy Consumption in the UK, Imperial College, 2009.

⁶² Based on a variety of sources, including IPCC (2007), Garnett (2008), Murphy-Bokern (2008).

⁶³ Livestock's Long Shadow, LEAD/FAO, 2006.

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3.2.6.2 *Genomics*

Selective breeding has – and will continue to offer – opportunities for reducing GHG emissions per animal. Modelling studies by Cranfield University have shown that past attempts to select for production traits, such as milk yield fertility, growth and feed efficiency have significantly reduced GHG production per unit of food produced over the last twenty years. In pigs, dairy cows and chickens, these gains have been significant in the pre-farm-gate stage – around 1% per year, or 20% over two decades. Similar gains are expected over the next 15 to 20 years. In addition, continued selection for lower fat rates in pigs should reduce wastage, and therefore post-farm-gate emissions.

Genetic improvements carry the further benefit of being easy to pass on to farmers, and as long lasting as breeders choose them to be. They often represent an economic benefit to the farmer, as well as an improvement in eco-efficiency. However, if their effect is simply to increase the stock numbers, then there may be little or no net environmental gain. Until now, selective breeding has sought merely to improve economic productivity; in future, it should be used to reduce GHG emissions.

The effectiveness of selective breeding techniques is predicated upon efficient measurement of feed conversion rates. Attempts are being made to improve these measurement techniques, as well as the science that lies behind them, but further research and development is needed. Once measures are reliable and cost effective, producers and retailers should use them to report on the efficiency of breeding measures to reduce GHG emissions.

It should be noted, however, that genetic measures to reduce GHG emissions may have unintended negative consequences. (Please see Section 6.2 for a further explanation, since these consequences relate mainly to animal welfare concerns).

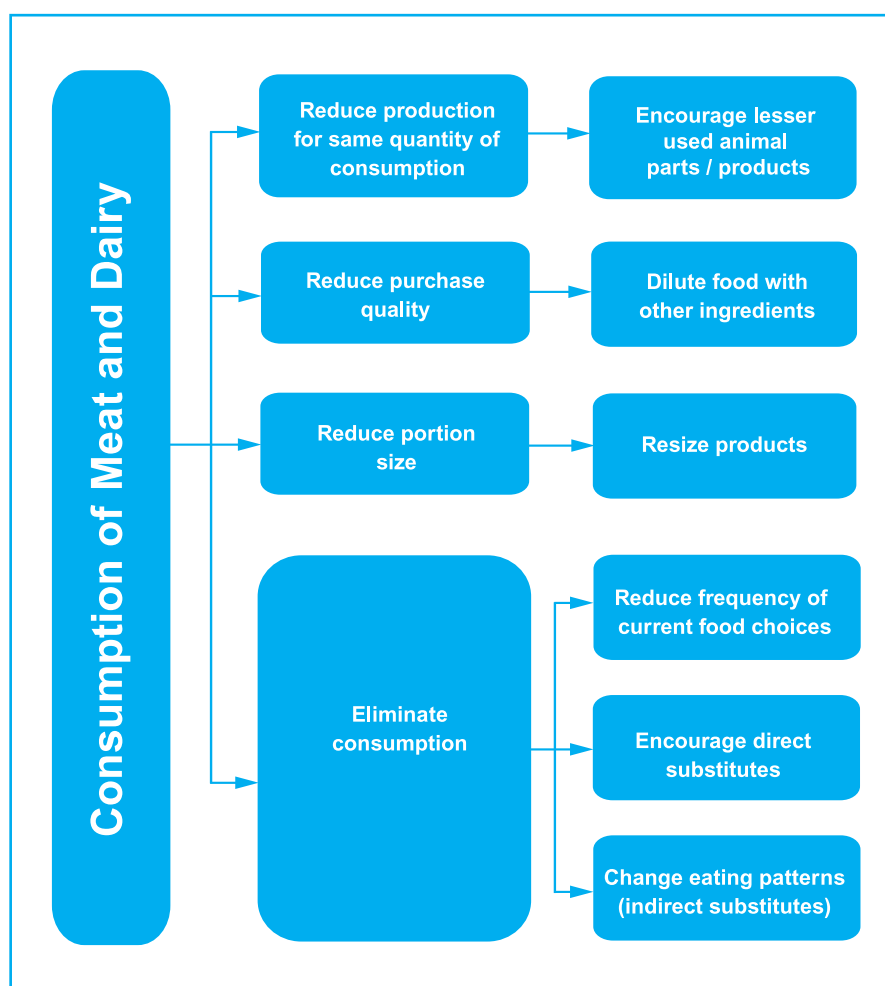
3.2.6.3 *Consumers*

What we choose to eat largely determines what our farmers produce and what we import, so we need to change our consumption habits. These habits, particularly with relation to cooking and waste, must be well understood, and, where appropriate and possible, guided by the key actors in the supply chain, including farmers, agricultural service providers, processors and retailers. The most important of these habits (in no particular order) are:

- Using energy-efficient appliances to refrigerate and cook food
- Using energy-efficient cooking techniques, such as placing the lids on saucepans, not using the oven for individual portions, and avoiding food waste
- Reducing the proportion of high-impact foods in our diets.

The full range of options is set out in the following chart from Imperial College (Figure 19).

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Figure 19 Strategies to reduce the impacts of meat and dairy consumption⁶⁴

3.3 Eutrophication and acidification

3.3.1 Nature, causes and impacts

Eutrophication is an increase in chemical nutrients — nitrates, phosphates and ammonia — in an ecosystem, and may occur on land or in water. Build-ups of these nutrients cause a range of effects, including lack of oxygen and severe reductions in water quality, fish, and other animal populations. They can also cause excessive (unwanted) plant growth and decay. Eutrophication can occur as the result of chemical fertiliser use in the production of feed crops, most notably soya; in the case of pigs, it is driven mainly by this and by the production of urine.

⁶⁴ Strategies for Reducing the Impacts of Red Meat and Dairy Consumption in the UK, Imperial College, 2009.

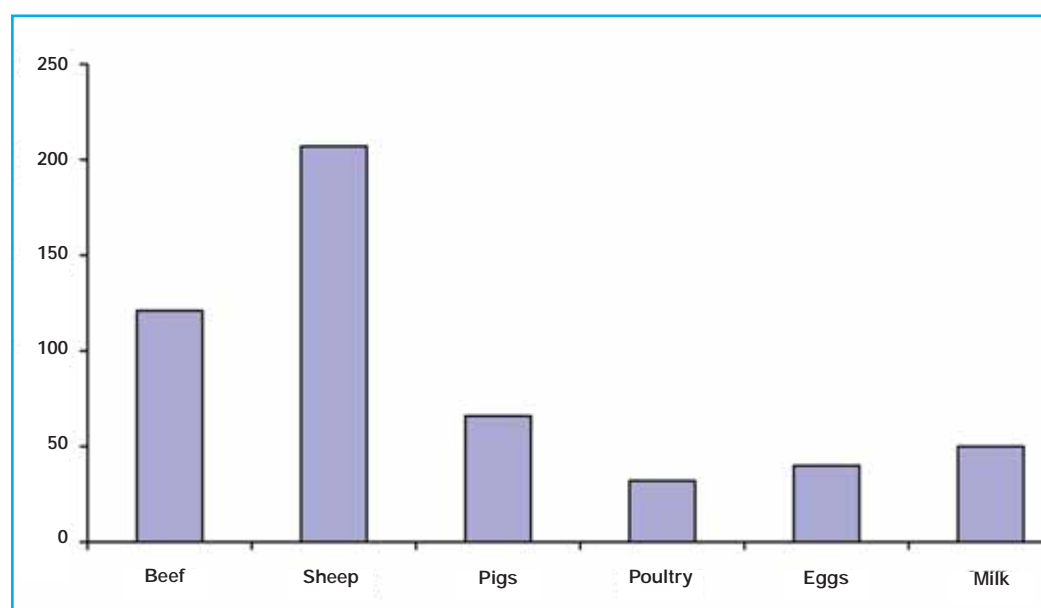
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Eutrophication and Acidification *cont'd*

Acidification is the result of rising Ph values in the natural environment, such as the atmosphere, and is caused mainly by ammonia (NH_3) in urine. When urine is deposited on land, the associated ammonia acidifies and eutrophies soils. Some of this ammonia is then released into the atmosphere, where it can contribute to smog and acid rain. Pig urine produced in the UK significantly affects reactive nitrogen levels in the UK, in neighbouring countries, and as far afield as the USA and Asia.⁶⁵ There is debate over whether or not these particles affect human health, but evidence one way or the other is difficult to find.⁶⁶

Figure 20 shows, sheep and beef cattle have the largest eutrophication potential per tonne of carcase produced, followed by pigs, milk, eggs and poultry.

Figure 20 Eutrophication Potential per tonne produced (KGs of PO43-)



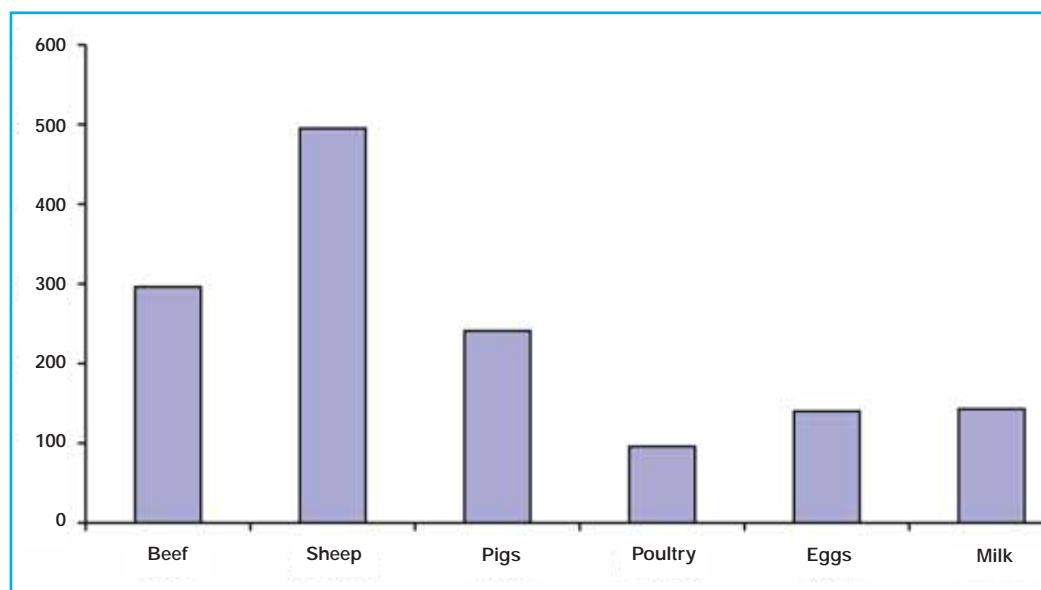
An important cause of eutrophication and acidification is the use of fossil-based fertilisers that fix nitrogen in the soil.

Pork's relative contribution to acidification is similar to that of eutrophication: lower than beef or sheep meat, but higher than other sources of animal protein, such as poultry, eggs and milk.

⁶⁵ Murphy-Bokern explains the impacts thus: "Ammonia gas and ammonium particles are transported long distances and deposited to ecosystems as a dry deposit or in rainfall. Since the major source is in rural areas, a wide range of semi-natural and sensitive wild ecosystems are affected. Ecosystems such as heath and moorland are particularly sensitive. In other ecosystems such as deciduous forests, nitrogen responsive grasses thrive at the expense of woodland flowers. Overall, a wide range of European ecosystems are estimated to be suffering from the effects of ammonia. There is huge spatial variation in deposition with very high loads down-wind from large livestock facilities. It is possible to reduce burdens on sensitive habitats through spatial planning of livestock production and landscape level measures such as buffer strips. From a global viewpoint, the relocation of livestock production to arable regions of the world with resilient soils may contribute to reduction in impacts. Ammonia deposition in such arable dominated eco-systems generally has a lower impact compared with emissions in localities close to forest, heath and moorland.

⁶⁶ An assessment of the environmental impacts of UK food consumption, Donal Murphy-Bokern, 2008.

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Figure 21 Acidification potential per tonne produced (KG SO₂ equivalent)

About 74% of Europe's ammonia emissions come from the livestock ⁶⁷, plus an additional 9% from artificial fertilisers. In the UK, livestock directly produce around 77% of ammonia emissions, with an additional 12% from soil. UK emissions of ammonia have reduced by about 15% since 1990, and now sit at around 315,000 tonnes per year. ⁶⁸ Whilst some of these reductions have come from the use of more eco-efficient fertilisers, most are due to reductions in non-agricultural emissions. (The emissions from cattle, which account for about half of all emissions, remained largely unchanged over the last 20 years).

3.3.2 Nitrogen

Man's impact on the nitrogen cycle is second only to man's impact on the carbon cycle in terms of its consequences for the global environment. The intensification of the nitrogen cycle – by using legumes and nitrogen fertilisers to fix nitrogen in the soil – has been the greatest driver of agricultural productivity. These practices initiate a cascade of transformations, each associated with climate change, acidification and eutrophication. In this respect, there is a tension between economic efficiency and environmental efficiency of pork production. The “carrying capacity” of the natural environment must still be born in mind.

3.3.2.1 Mitigation

Measures to address nitrate levels in water have reduced the use of nitrogen fertilisers in the UK, but there has been little effort to address the nitrogen cycle as a whole. The nitrogen balance of UK agriculture is poorly understood, and has not been the focus of policy action. There is little attention paid in UK agriculture to farm level nitrogen balance and efficiency, but their consequences are now becoming evident in life-cycle assessments. For example, the environmental profile of pork from Denmark (where there has been a greater concentration on nitrogen efficiency) is better than that of the UK, largely because of the more efficient use of nitrogen during production.

⁶⁷ Sutton, 2006, in Murphy-Bokern, 2008.

⁶⁸ Murphy-Bokern, 2008.

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Eutrophication and Acidification *cont'd*

This has been achieved mainly by reducing the amount of soya in pig feed stock by 40%.⁶⁹ Further improving the nitrogen balance of UK agriculture would encourage reductions in soya imports and their associated impacts.

Successfully reducing ammonia levels depends on a combination of two things: improvements in nitrogen efficiency; and reductions in inputs. There is also a need for spatial strategies to minimise the impacts of a given level of nitrogen emissions. Overall, however, it is probably not possible to avoid excessive nitrogen emissions at the current level of livestock farming in northwest Europe.

3.4 Water

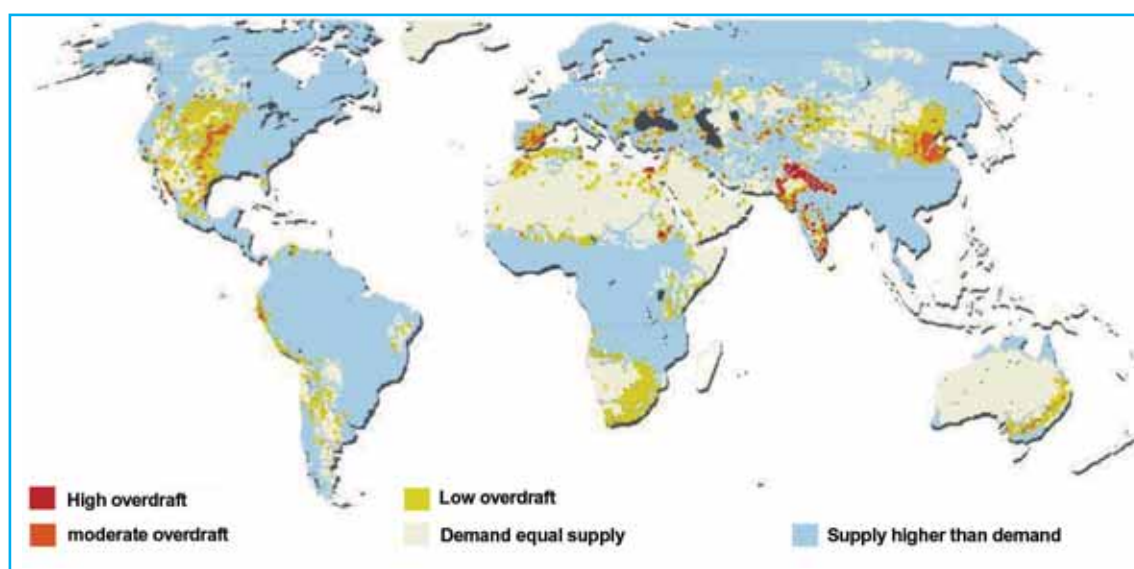
3.4.1 Nature, causes and impacts

Fresh water accounts for only 2.6% of the Earth's water resources. 99% of this fresh water is in the form of ice and ground water; only 1% lies in rivers, lakes, wetlands and soil.

An adequate supply of clean, fresh water is as essential to agriculture as it is to every other area of human existence; water quality and availability directly affect the productivity of pig rearing operations. Furthermore, agriculture has a profound effect on the availability and quality of water, because of the amount that it requires for irrigation, the ways in which it alters patterns of drainage, evaporation and transpiration, soil water content and the efficiency of water as a vector for environmental pollutants.

Although the UK may not suffer from local water scarcity nearly as much as many other countries, it is already more than a threat; hosepipe bans and other water conservation measures have become routine, and will become more frequent as our climate becomes drier and warmer. Figure 22 shows that, by 2000 (before five of the ten hottest years on record) the supply of water in the UK only just met demand.

Figure 22 Water availability and scarcity around the world⁷⁰



⁶⁹ Defra, 2002 in Murphy-Bokern, 2008.

⁷⁰ "Ecosystems and Human Well-being: Synthesis" Millennium Ecosystem Assessment, 2005.

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Water is much more likely to contain high concentrations of pollutants where rainfall is low, than where it is high, ⁷¹ although concentrations can also be high in high rainfall areas if fertiliser is applied during heavy rainfall. Even though artificially fertilised arable crops have low total nitrate emissions, concentrations in water from arable land in England can be high in low rainfall areas. In East Anglia, where excess rainfall is less than 150 mm per year, the emission of only 15 kg N ha⁻¹ as nitrate is sufficient to bring nitrate levels in water above the 50 mg nitrate per litre limit ⁷² (Defra 2002).

In the same way that water entering soil can be problematic, soil entering water (as a result of water erosion) can be just as damaging. Soil is a pollutant of water and is a particular problem wherever soil is tilled and where livestock remove vegetation by over-grazing. Pigs are naturally rooting creatures, loosening and turning soil as they feed. Where they are allowed to feed on open land, their rooting can have impacts that are negative, neutral or beneficial, depending on local weather and soil conditions. Whether for good or bad, they can change the rates and nature of soil drainage and transpiration.

Water infiltrates easily on soils under conservation agriculture, increasing the groundwater level, and reducing both surface runoff and soil erosion. This effect has been observed as far afield as the Cerrado do Brasil, whence the UK sources soya for pig feed, and where natural springs that had disappeared under intensive agriculture started to flow again under conservation regimes.

3.4.2 Embedded water

5146m³ of water are required to produce each tonne of pig meat consumed in the UK. (To see how this varies between different types of pork meat products, and a range of other animal products, see Appendix II.) Pork's "water footprint" in the UK – a measure of all the water transpired by feed crops and forage, drinking water for pigs, and water used in processing and manufacture ⁷³ – is 91m³ per person per year, which is around 249 litres per person per day related to pork consumption in the UK. This is less than beef, but considerably more than chicken, eggs or lamb (Figure 23). Furthermore, because pig feed contains a large proportion of imported products (notably soya from Brazil), the "external" part of its water footprint – in other words, the amount of water embedded in processes that happen outside the UK – is high in proportion to its "internal" water footprint: 88 litres of water per person per day are from the use of water resources within the UK; the rest is imbedded in imported products, such as feed. ⁷⁴ Feed developed from less thirsty crops, or as a by-product of other processes (such as human food production), or from waste, would give pork consumed in the UK a much lower water footprint.

⁷¹ Murphy-Bokern, 2008.

⁷² The Government's Strategic Review of diffuse water pollution from agriculture in England. Paper 1: Agriculture and water: a diffuse pollution review, Defra, 2002, in Murphy-Bokern, 2008.

⁷³ Globalization of Water: Sharing the Planet's Freshwater Resources, Hoekstra and Chapagain, Blackwell, 2007.

⁷⁴ Water Footprint: The Impacts of the UK's Food and Fibre Consumption on Global Water Resources.

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Water *cont'd*

Figure 23 Internal and external water footprint of livestock products consumed in the UK (per capita per year) ⁷⁵

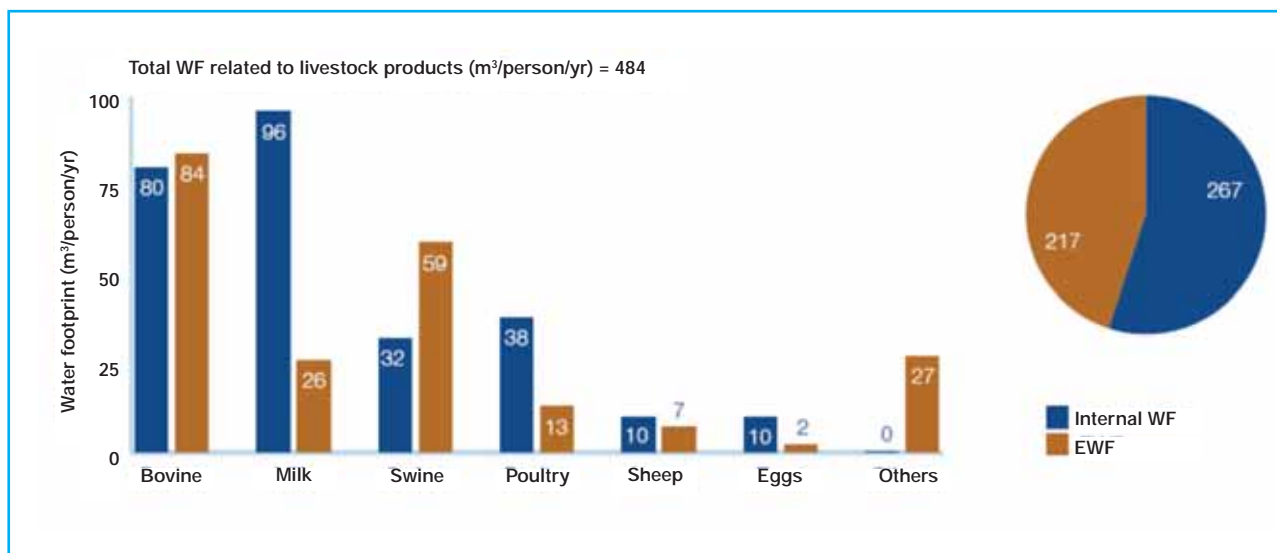
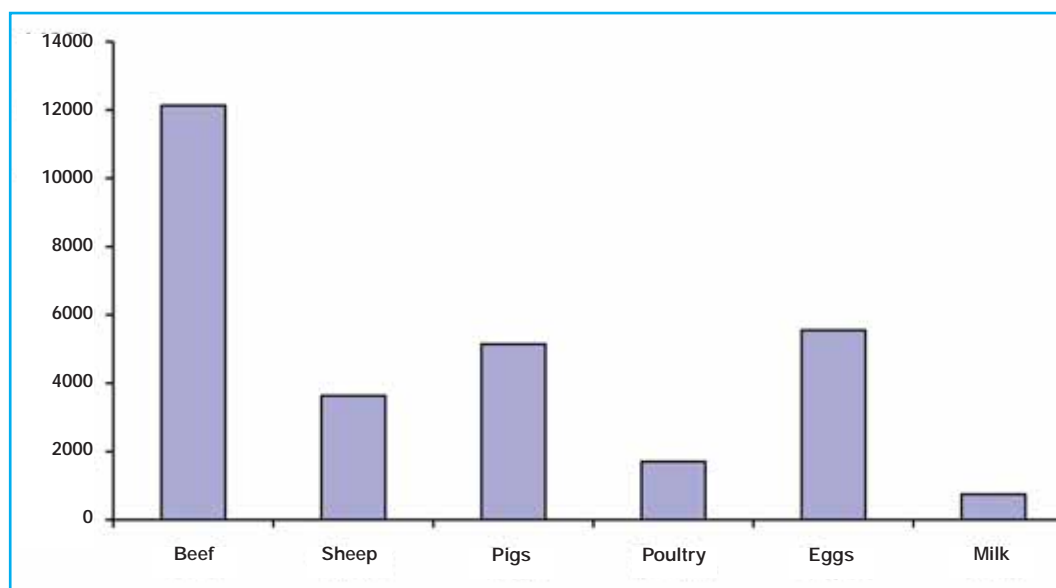


Figure 24 Water footprint per tonne of livestock product consumed in the UK (1000m³)



The virtual water content of products is typically 1,000 to 20,000 times their weight, with lower quantities for cereal crops and the higher quantities for livestock products. All vegetation transpires water, and the data on virtual water alone make no distinction between the transpiration of scarce or plentiful water, rain-fed or irrigated crops.

In informing food consumption, it is important to consider the hydrological impact of water use, which might vary considerably from one location to another. ⁷⁶ To distinguish between more and less damaging

⁷⁵ Ibid.

⁷⁶ Water Footprint: The Impacts of the UK's Food and Fibre Consumption on Global Water Resources

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water use, academics have developed the concept of “blue” and “green” virtual water embodied in agricultural products. Green virtual water is the rainwater that feeds crops directly, while blue virtual water is abstracted from rivers and aquifers, then delivered to crops through irrigation. The trade in crop commodities can be analysed in terms of green and blue virtual water; such an analysis suggests that the trade in virtual green water could contribute to the mitigation of water scarcity in deficit regions.⁷⁷ In other words, trade in food can be used to move virtual green water to regions where water is scarce and food production is dependent on blue water.

3.4.3 Mitigation

Industry, agriculture and a growing population put considerable strains on water quality and availability, especially in the South East of England. Since the amount and quantity of available water varies from place to place and time to time, it is hard to generalise about water efficiency strategies. These strategies, however, are necessary in both rearing and processing. Local farmers and processors may need to work closely with neighbours and water authorities to ensure that they are not exceeding withdrawal capacities or wasting the extracted water. Where possible, water should be kept in “closed-loop” systems that allow it to be re-used, rather than wasted. Furthermore, enough should be left to assure the health of the local ecosystem.

Farmers, processors, retailers, policy makers and local authorities must work together to assure good water management by providing proper limits and sanctions, and offering advice and support for businesses.

3.5 Biodiversity

3.5.1 Threats and opportunities

Ecosystem services enhancements over the past 50 years have primarily involved food production: crops, livestock, and aquaculture. At the right stocking density, grazing livestock enhance biodiversity on grazing land. According to Tara Garnett: “Their constant nibbling, chomping and stamping controls the vigor of dominant or invasive species, allowing other less robust plants to thrive... On the other hand, a monopoly by one grazing species on a particular area – as is often the case in the UK – can create a landscape with limited biodiversity... The low levels of biodiversity on UK agricultural land are the consequence of high fertiliser application levels and the sowing of very simple grass-clover mixes. According to one 2002 report, over 95% of semi-natural grasslands no longer have any significant wildlife conservation interest”.⁷⁸

In the UK (as in the rest of Europe) farmland bird populations have been particularly hard hit (Figure 25). According to Defra, populations of these birds have dropped by 48% in just 20 years. Between 1975 and 2000, populations have dropped by 86% for the grey partridge, 55% for the lapwing, 69% for the turtle dove, 62% for the skylark, 74% for the yellow wagtail, 56% for the song thrush, 95% for the tree sparrow, 60% for the reed bunting, and 80% for the corn bunting. In June 2009, the cuckoo was added to the IUCN’s Red List of Endangered Species.⁷⁹

⁷⁷ Water Footprint: The Impacts of the UK’s Food and Fibre Consumption on Global Water Resources.

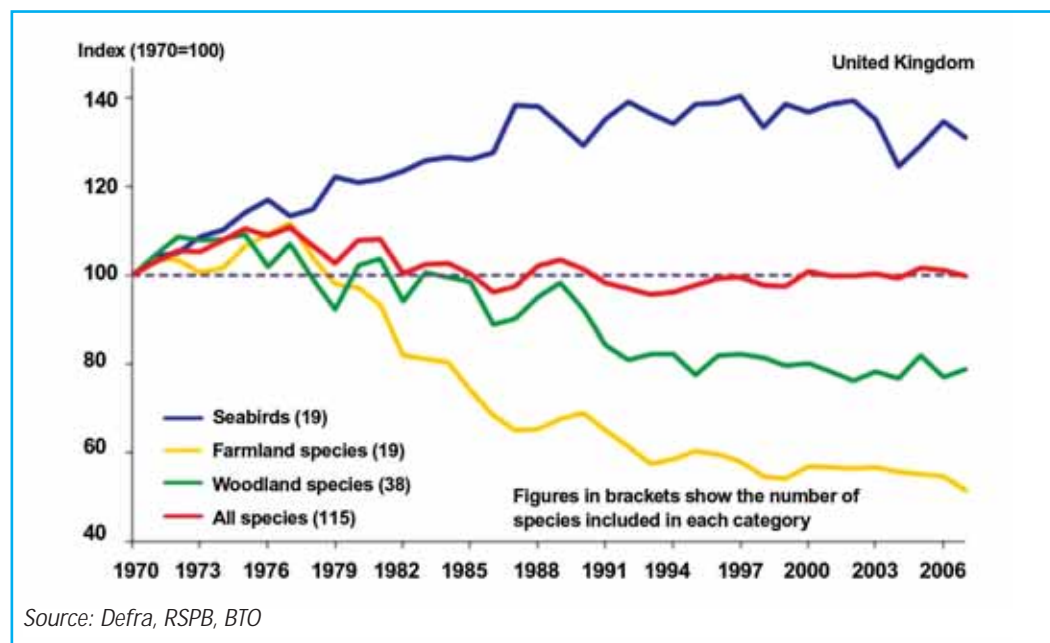
⁷⁸ *Cooking Up a Storm*, Garnett, 2008.

⁷⁹ www.iucnredlist.org

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Water *cont'd*

Figure 25 The decline in the populations of common UK birds ⁸⁰



Pigs can be particularly destructive to vegetation, and therefore to invertebrate and bird populations.

Furthermore, the conversion of wild habitats to agricultural land brings many changes to local ecosystems. Species that are deprived of their wild foods die away, while others expand exponentially.

One of the greatest threats to biodiversity on land used for pig rearing is ammonia. In 2000, 9% of the UK's ammonia emissions came from pigs. ⁸¹ Ammonia emissions close to pig buildings can acidify the surrounding area, significantly affecting ecosystem conditions. The extent of this effect is not known, but could be predicted using atmospheric dispersion modeling and established emission factors. ⁸²

Furthermore, high concentrations of ammonia in the air can damage plants such as lichen, moss and heather, which are important components of balanced habitats. Such high concentrations are not widespread in the UK, and usually only occur near major ammonia sources, such as large pig and poultry units. This is of particular concern where pig rearing units are close to valuable habitats.

The majority of pigs in the UK are raised in intensive indoor systems. Around 40% are raised outdoors. A very small proportion (around 2%) are raised in extensive organic systems, sometimes using hardy, traditional breeds that are grazed on semi-natural vegetation at very low stocking rates. These more "traditional" systems can have environmental and social benefits, including lower use of artificial fertilisers and pesticides, elimination of "unsustainable" feed crops, the preservation of traditional landscapes and cultural activities, and lower levels of pollution. However, they may present economic challenges to mainstream production.

⁸⁰ www.defra.gov.uk/environment/statistics/wildlife/kf/wdkf03.htm

⁸¹ Defra, 2000.

⁸² Murphy-Bokern, 2008.

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Some parts of the UK, such as the New Forest and the Forest of Dean, still practice the ancient rite of pannage, whereby pigs are given the right to graze common land. In these areas, pigs are valued for their ability to clear up acorns quickly and efficiently, thereby reducing the likelihood of acorn poisoning in species that are less able to tolerate them (such as cattle and horses). However, these activities happen on a very small scale.

Pigs have also been used to manage bracken, and proved effective in reducing stand density if used in conjunction with cutting or spraying. However, at inappropriate stocking levels the pig foraging strategy of digging for rhizomes is likely to result in significant loss of all vegetation cover.⁸³

Imported soya for pig feed can also carry a heavy biological price in its country of origin, since soya farmers have expanded at the expense of Latin America's natural habitats – the grasslands of the Brazilian Cerrado, the uniquely diverse Amazon,⁸⁴ the Atlantic Forest,⁸⁵ and the Chacos region.⁸⁶

3.5.2 Ecological footprint

The ecological footprint of an activity such as farming is measured in hectares of biotic resources required to carry it out. (For a technical explanation, see WWF's Living Planet Report).⁸⁷ Few attempts have been made to measure the ecological footprint of pig products in the UK, but we do have data compiled in 2005, relating only to products consumed in the Cardiff area⁸⁸ (Figure 26). According to this data, pork, ham and bacon contributed 1.56% of Cardiff's total ecological footprint, compared with over 10% for beef and veal, 2.57% for lamb, and 1.55% for uncooked poultry. At 0.2 ha/Kg consumed, pig products had a lower ecological footprint than beef and veal (1.57ha/Kg), sheep meat (0.8ha/Kg) and poultry (0.24 ha/Kg). Only eggs and milk had lower ecological footprints per Kilogram, at 0.12 and 0.14 hectares, respectively. (Fresh fruit and vegetables had considerably lower ecological footprint, at just 0.03 ha/Kg).

⁸³ *Cooking Up a Storm*, Garnett, 2008.

⁸⁴ The Amazon is the world's largest tropical forest and one of the most naturally diverse regions on Earth. It plays a crucial role in regulating the global climate.

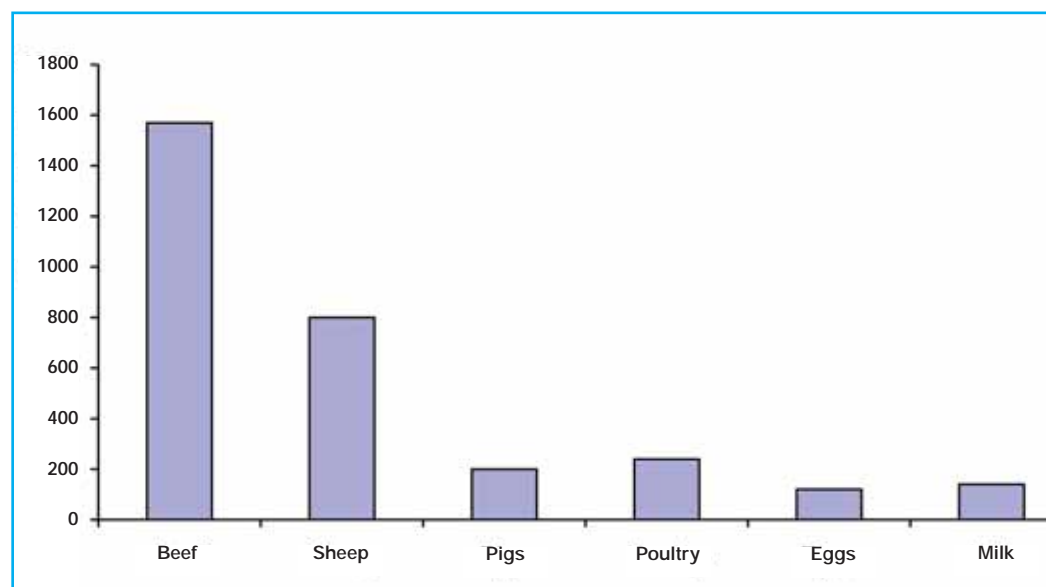
⁸⁵ The Atlantic Forest is home to around 8,000 unique plant species, but just 10 per cent of its original area remains in increasingly isolated fragments.

⁸⁶ The Cerrado is one of the world's largest and most naturally diverse savannah regions, home to endangered species including the giant otter and hyacinth macaw. Around 70 per cent of the Brazilian Cerrado has been converted to agriculture, including the production of soya.

⁸⁷ Living Planet Report 2008, WWF, 2008.

⁸⁸ *Reducing Cardiff's Ecological Footprint*, Collins, Flynn and Netherwood, Cardiff University, 2005.

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Biodiversity *cont'd*Figure 26 Ecological footprint per tonne produced (hectares)⁸⁹

3.5.3 Mitigation

The following measures would reduce the ecological footprint of pig production in the UK:

- Extensive production (to increase the variety and population sizes of organisms lower down the food chain) combined with lower stocking levels (to avoid swamping eco-efficiency gains)
- Reductions in the release of urine (and therefore ammonia contamination) to farmland (which requires low stocking levels in extensive systems)
- Improved water management, both within breeding units and in their surrounding ecosystems
- Greater use of local biotic wastes, such as waste and by-products from the human food. (This will require a review of the ban on swill to identify whether or not some currently banned ingredients may safely be re-introduced)
- Reduced use of soya imported from ecologically sensitive areas, such as the Amazon, the Cerrado do Brasil and the Atlantic Forest.

Defra Project ISO215 is looking at the environmental impact of outdoor pigs and will be reporting on alternative cropping strategies (undersown cereals, root crops) and persistence of different types of vegetation. This should be used for future guidance.

⁸⁹ Source data from the Living Planet Report, WWF, 2008

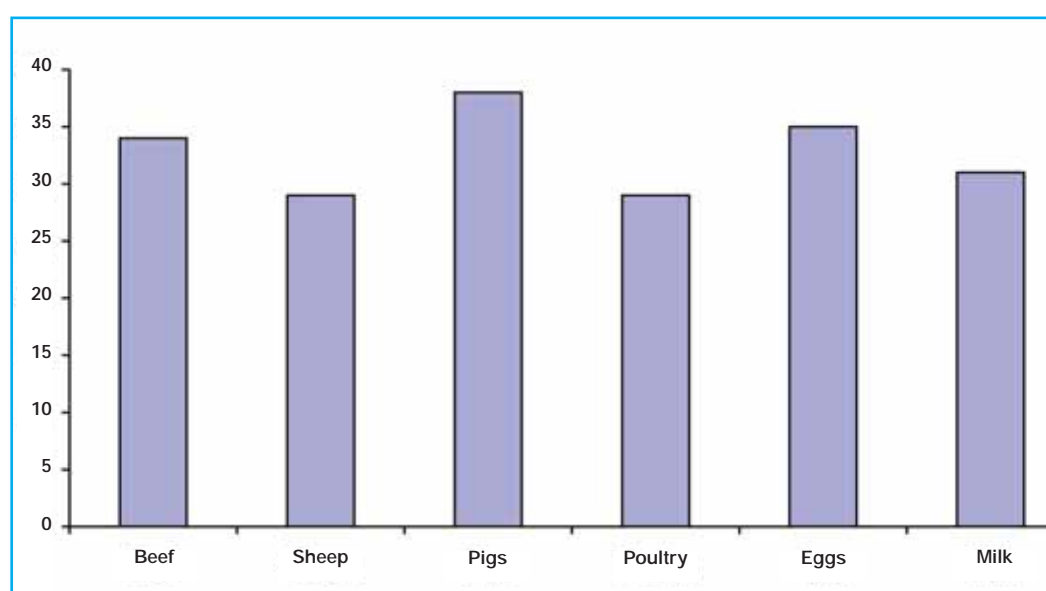
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3.6 Abiotic resource depletion

3.6.1 Nature and scale

Abiotic resources are those that, once extracted from the environment, cannot be replaced, such as scarce minerals and fossil fuels. Cranfield University has measured how different types of animal products deplete these resources, and the results are plotted in Figure 27. (Scores are based on the remaining global resource reserves and their rates of depletion, and expressed in Kilograms of antimony (Sb) equivalents). The abiotic scores reported by Cranfield do not vary a great deal between species, but are greater for pigs than for any other animal products. This is likely to be the result of the high proportion of soya – and therefore fossil-based fertilisers – in pig feed.

Figure 27 Abiotic resource use (Kg antimony per tonne produced) ⁹⁰



3.6.2 Mitigation

As with biodiversity (above), abiotic resources can be saved by reducing the proportion of soya in feed, and making greater use of waste and by-products from other processes and systems.

3.7 Waste

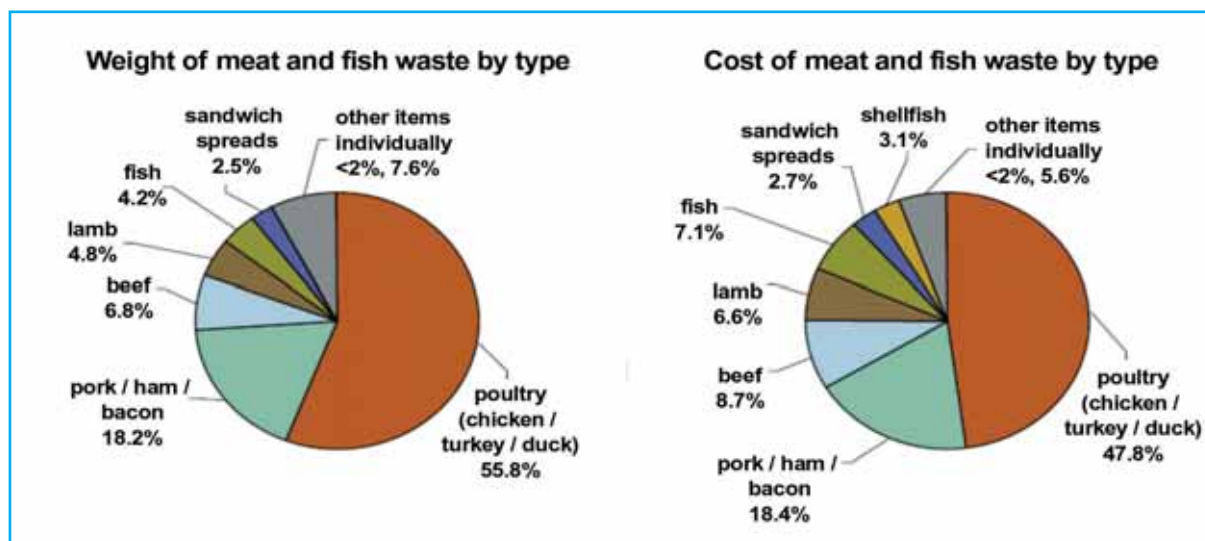
UK households throw away 6.7 million tonnes of food waste every year. Of this, nearly a fifth - 4.1 million tonnes - could have been eaten if it had been stored or managed better. Of the avoidable meat and fish waste, almost a fifth (18.2%, or 102,200 tonnes) is in the form of pork products. This is significantly less than poultry (55.8%) but twice the figure for beef (6.8%) (Figure 28).

⁹⁰ "Determining the environmental burdens and resource use in the production of agricultural and horticultural commodities", Williams, A.G., Audsley, E. and Sandars, D.L., Cranfield University/Defra, 2006.

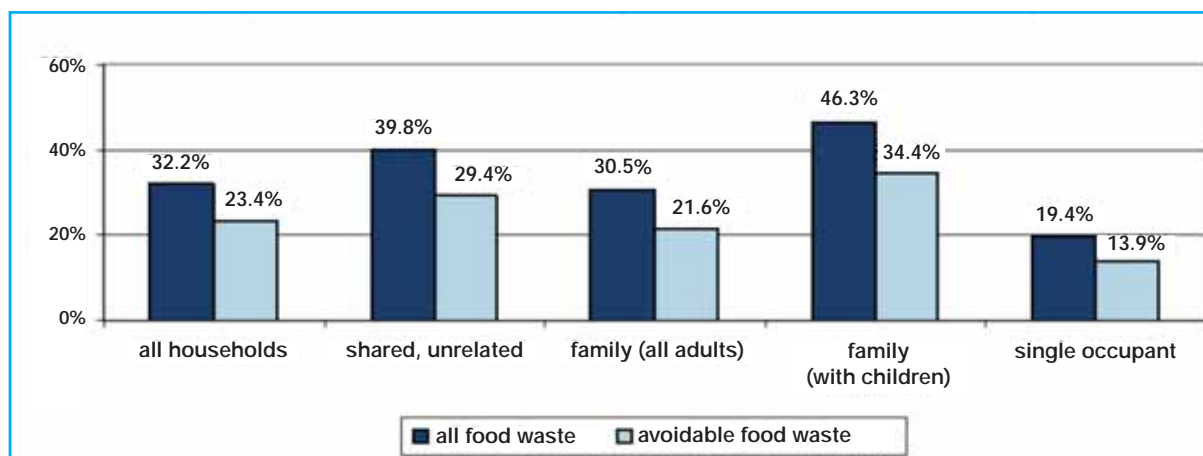
PIGS AND THE ENVIRONMENT

Waste *cont'd*

Figure 28 How different types of food make up meat and fish waste



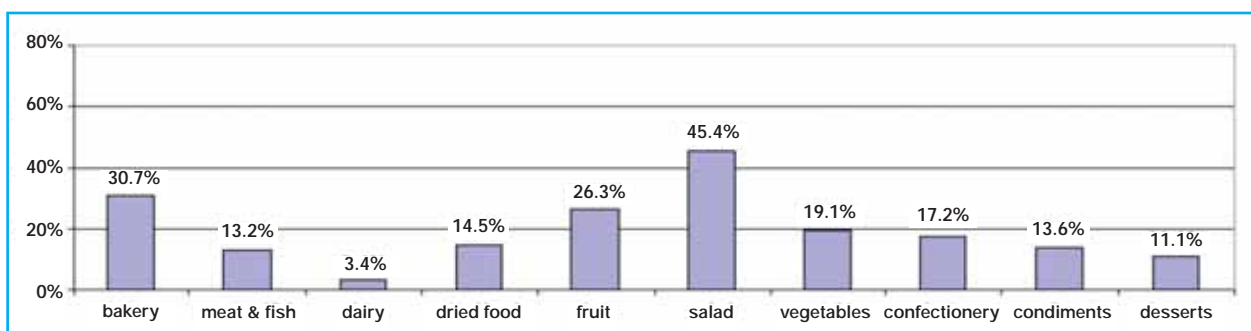
Families with children create the greatest proportion of avoidable food waste, closely followed by households shared by unrelated people. Each of these households wastes around a quarter of the food that is purchased that could have been eaten; single occupants throw away much less - just 11% (Figure 29).

Figure 29 Proportion of purchased food (cost) that is thrown away, by household type ⁹¹

Fresh, rapidly perishable foods, such as bread, fruit and salad tend to be wasted in high proportion; meat is relatively better managed by consumers, perhaps because it is more expensive and easier to buy in portions than some foods (such as lettuce) (Figure 30).

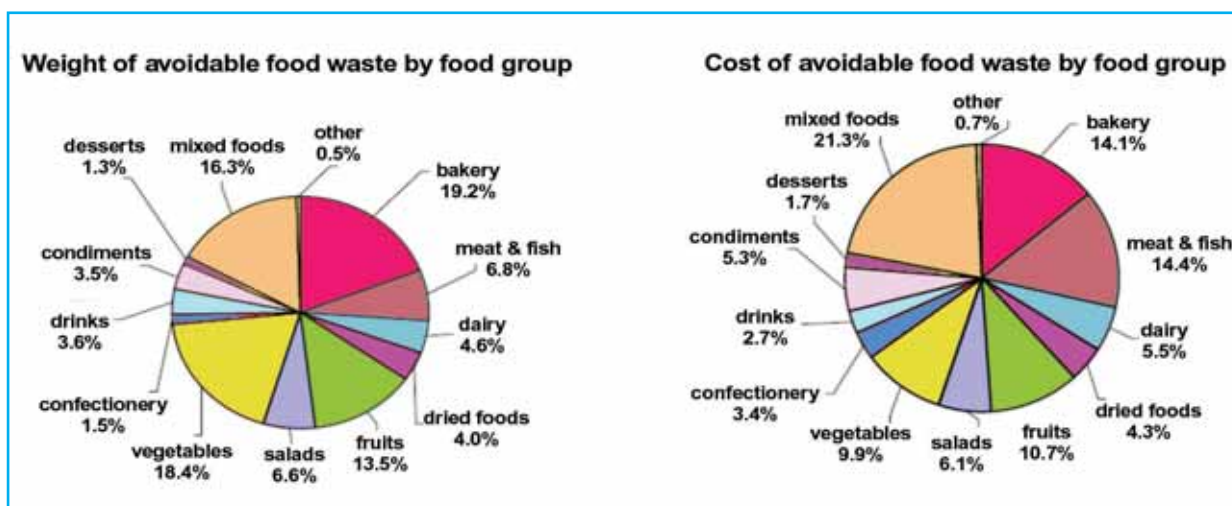
⁹¹ The Food We Waste, WRAP, 2008.

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Figure 30 Estimate of the proportion of food (cost) that is thrown away⁹²

The cost of wasted meat and fish meals is greater than for any other type of food (Figure 32). (The next most costly waste items are: breads; apples; and potatoes).

Figure 31 Food groups making up avoidable food waste



3.7.1 Mitigation

WRAP has a target to reduce consumer food waste by 100,000 tonnes by April 2011.⁹³ WRAP's Retail Programme has also worked to develop the Courtauld Commitment to reduce food waste. (This commitment applies only to "post-consumer" waste; i.e. waste that is generated by consumers, rather than processors or retailers. It covers both food waste and the relatively less significant area of food packaging waste). More than 30 retailers have signed up to this commitment.

For unavoidable post-consumer food waste (such as inedible parts), WRAP recommends home composting or the use of organic recycling services provided by local authorities.

It should be noted that merely reducing the amount of packaging used is not the only consideration for sustainability; innovative packaging technologies, such as contained gases, interactive films and re-sealable packages, can increase the shelf life of products, and thereby reduce post-consumer food waste.

⁹² Ibid.

⁹³ *The Food We Waste*, WRAP, 2008.

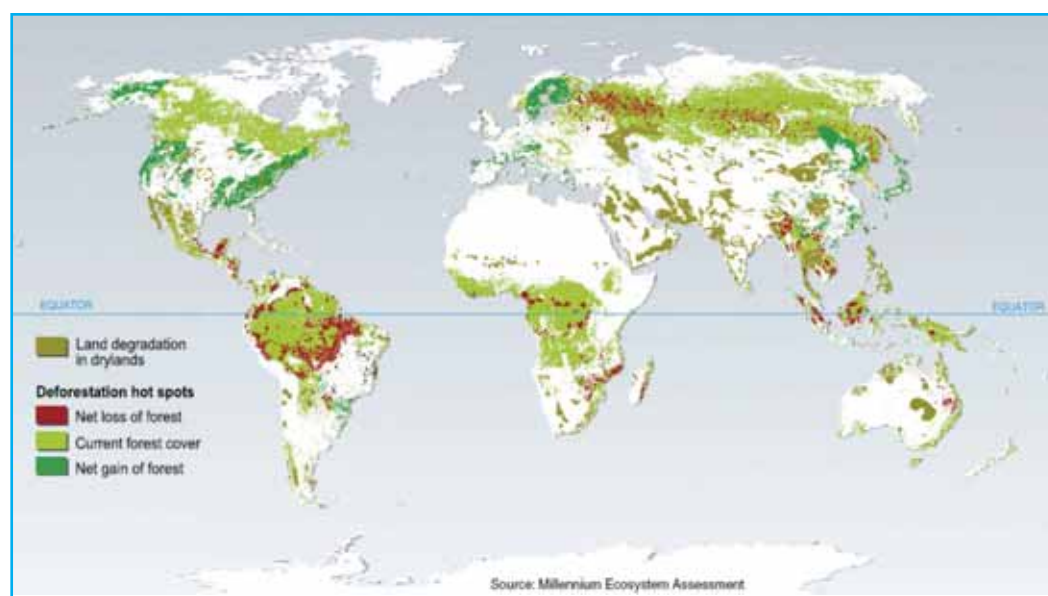
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3.8 Soya and deforestation

3.8.1 Sources, impacts and initiatives

UK food commodity consumption – including that of pork ⁹⁴ – increased by 15% between 1990 and 2005, while self-sufficiency in food fell from 70% to 60%. This drove an increase in the demand for animal feed of 51% (by weight). According to BPEX, pig feed comprises around 30% soya. Much of this is imported from Brazil and Argentina, and some of which comes from ecologically sensitive areas. For example, large areas of the Cerrado and Amazon regions have been cleared in order to plant soya, some of which finds its way to the UK. (Figure 32).

Figure 32 Deforestation across the globe ⁹⁵



Campaigners blame the growing global demand for soya bean and soya oil for the conversion of wild habitats and carbon sinks to agricultural land in sensitive areas.

3.8.2 Mitigation

While Greenpeace has taken action to prevent alleged illegal production of soya in the Amazon area by Cargill, most NGOs stop short of calling for a complete boycott on soya consumption, partly because some soya production is sustainable, and partly for fear of jeopardising the livelihoods of millions of people in developing countries.

WWF has convened the Round Table on Responsible Soy (RTRS) to establish global criteria for sustainable soya. ⁹⁶ These include: protecting areas threatened by soya bean expansion; and using zoning to restrict expansion to degraded or abandoned agricultural areas. Once formulated, these principles are likely to inform a set of standards for producers, processors and retailers (similar to those established for wood products by the Forest Stewardship Council). ⁹⁷ WWF has called for those buying to source only RTRS-certified soya, when it is available.

⁹⁴ The impacts of the beef industry in these regions are, perhaps greater; WWF claims that the UK market was the destination of about 7% of Brazilian beef exports in 2005 by weight, making the UK the largest developed country importer of Brazilian beef.

⁹⁵ Millennium Ecosystem Assessment – Ecosystem Services and Wellbeing, MEA, 2005.

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So far, around a hundred companies or organisations have joined the RTRS, including BUNGE, Rabobank, Shell International, Unilever and VION.

4 Human diet and health

A third of the world's cereal harvest and over 90% of its soya is used for animal feed.^{98 99} Because it takes many times more of these cereals to make vegetarian foods than to grow meat, environmental organisations are calling for reductions in meat consumption: the former Chairman of the Nobel Prize-winning United Nations Intergovernmental Panel on Climate Change (IPCC), Rajendra Pachauri, has called for people to go without meat for at least one day per week; WWF-UK recently called for a 15-20% reduction in meat and dairy consumption by 2020;¹⁰⁰ Compassion in World Farming claims that cutting meat consumption by a half would benefit the climate even more than similar cuts in domestic car use.

These calls are not going unheard by policy makers. In its current project to create a vision of sustainable meat production and consumption for the UK, Defra is canvassing opinion from all of these organisations. However, it seems unlikely that the government will call for meat consumption to be cut in the near future.¹⁰¹

Food intake – both in terms of calories and nutrients – is probably the most important factor behind the nation's health. Meat contains beneficial nutrients and a rich source of energy. Some meat also contains high levels of saturated fat, which has been associated with heart disease and Type II diabetes. The UK government's "Eatwell Plate" (Figure 33) offers recommended daily intakes (by proportion of total intake) of a variety of foods, based on their nutritional value (see graphic on next page). There is mounting pressure from non-governmental organisations and some government advisers – and an in-principle commitment by the FSA – to update the Eatwell Plate in light of the environmental and welfare impacts of its constituents. The Council of Food Policy Advisors, set up by Defra, is beginning to explore the options, but there is little co-ordination between the bodies that would need to inform such changes: the DoH, DEFRA, DECC, the FSA and the SCP.

⁹⁶ www.responsiblesoya.org

⁹⁷ www.fsc.org

⁹⁸ Although the oil that results is consumed directly by humans or used for biofuels.

⁹⁹ Ibid.

¹⁰⁰ WWF-UK Policy Statement on Food, 2009.

¹⁰¹ Headed by Bronwen Jones, Defra.

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Human diet and health *cont'd*

Figure 33 The UK Government's Eatwell Plate



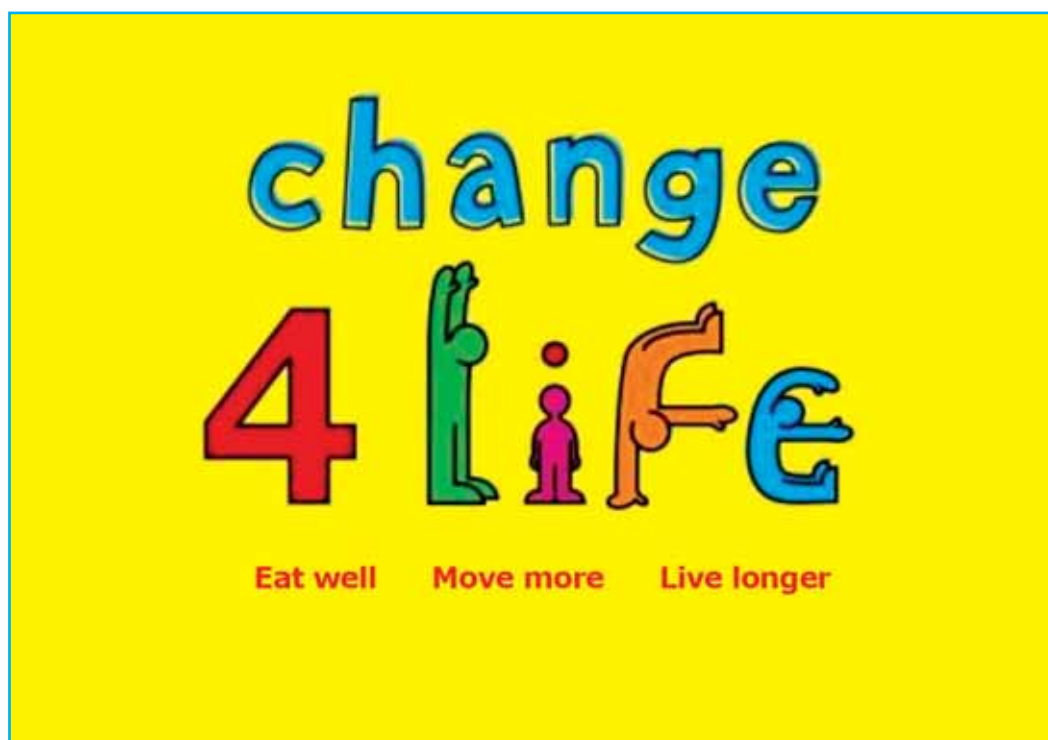
Obesity, on the other hand, is already well understood by government, which has been tackling it as a priority health issue for the past decade. As part of its efforts to combat obesity in the UK, the government has built strong capabilities and understanding of people's relationships with their food. It has used complex systems mapping (Figure 34) to develop a better understanding of how to tackle this problem, and to develop its high-profile "Change4Life" campaign.¹⁰² Change4Life has been criticised by many public health observers for failing to tackle the causes of obesity, including an "obesogenic environment". Nevertheless, complex systems mapping of the type used to develop the Change4Life campaign could be used to map the drivers of environmental impacts, building on the findings of this report, and on ERM's Lifecycle Analysis of the pork sector.¹⁰³

¹⁰² www.nhs.uk/Change4Life/Pages/default.aspx?gclid=CKT-qPH4-poCFRWA3godKx4udQ

¹⁰³ Scoping Lifecycle Assessment of Pork Production, ERM, 2009 and subsequent reports (unpublished).

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Figure 34 Logo of the UK Government's Change 4 Life healthy eating campaign



5 Culture

In our daily lives, we think about and interact with food far more than we do with the weather (which is regarded as a national obsession). We probably spend more of our time planning, shopping for, preparing, eating and clearing away meals than we do on anything other than working and sleeping. For us, food is far more than a way to maintain healthy, vigorous bodies and minds: it is the symbol and focal point for a wealth of familial, social, cultural and religious rituals; it is a predictor and product of our geographic, social and economic background; it is the subject of media entertainment and public campaigns; it is the stuff of habit; and it is a statement of who we are, both individually and collectively.

It is important for pork producers and processors, and for retailers, to understand these relationships at a deep level, and to consider cultural impacts when formulating environmental policies. BPEX/AHDB can contribute to this effort by polling its members and participating in broader discussions, such as those currently being mediated by Defra, The Cabinet Office Strategy Unit, WWF-UK ("One Planet Food") and others.

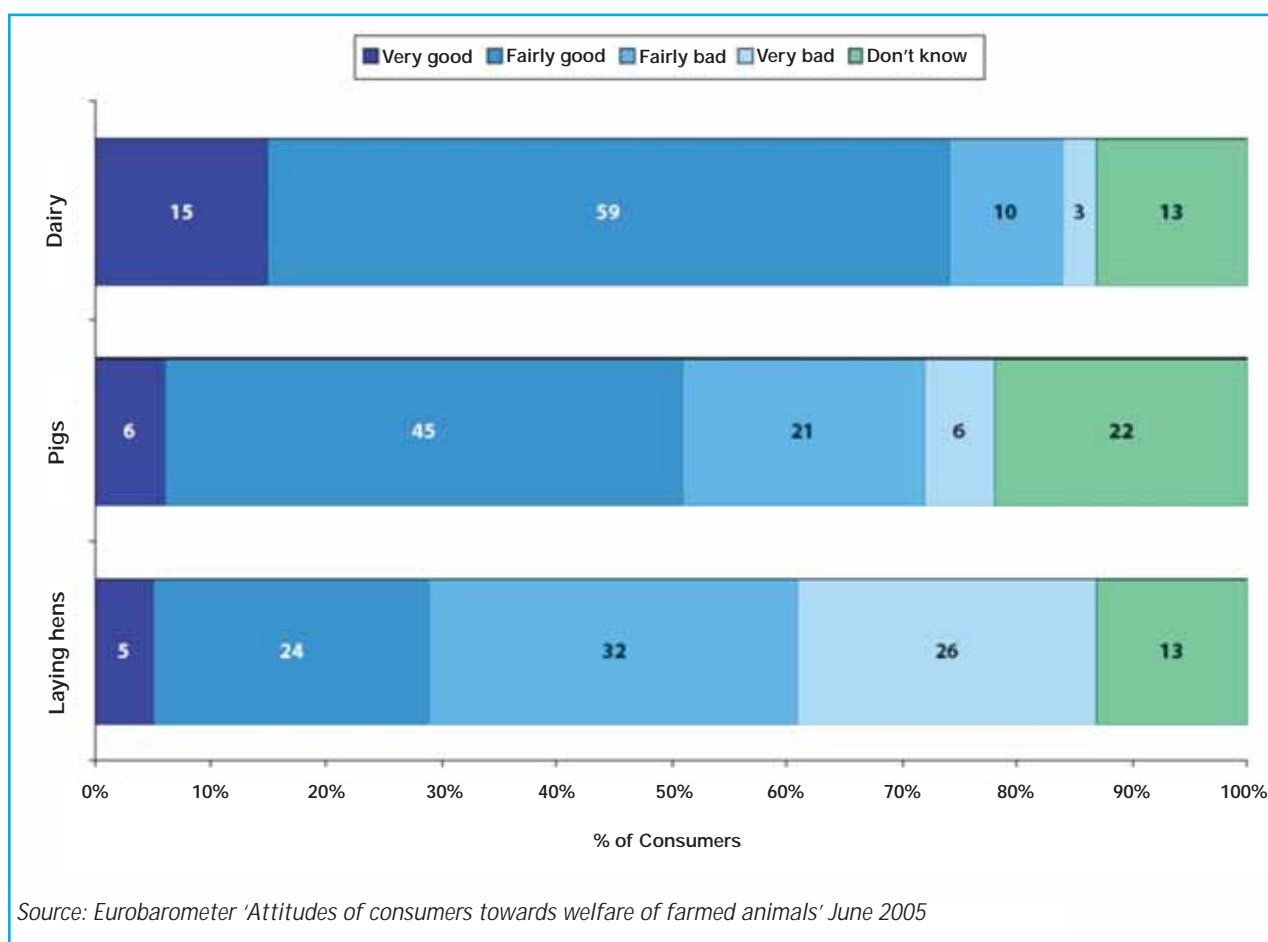
6 Animal welfare

6.1 Consumers

Consumers say they are highly concerned with animal welfare. In the past, consumers have boycotted products made from animals they consider to have been cruelly treated, including veal, foie-gras, battery eggs and various non-food items, such as cosmetics. Investigative journalists from the mainstream media, sometimes in collaboration with animal rights campaigners, have exposed practices and some systemic conditions that the majority of UK residents claim to find unacceptable (although the majority of people still buy battery eggs).

Pig products have escaped such boycotts. Whereas only a third of consumers believe that laying hens are well or fairly well treated, a small majority of consumers think that pigs are. (See Figure 35, and note that dairy cattle are seen as well or fairly well treated by three quarters of the surveyed sample).¹⁰⁴ Consumers are not aware of any major welfare issues with relation to pigs: 22% of them claim not to know how well or badly pigs are treated, compared with 13% for laying hens and dairy cattle.¹⁰⁵

Figure 35 Perceived welfare standards of selected food species¹⁰⁶



¹⁰⁴ Consumer Attitudes to Animal Welfare, IGD, 2007.

¹⁰⁵ Ibid.

¹⁰⁶ Ibid.

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Furthermore, more consumers tend to be concerned with the welfare of laying hens and chickens than with cows, pigs or lambs (Figure 36).

Figure 36 Percentage of consumers concerned with the welfare of selected species ¹⁰⁷



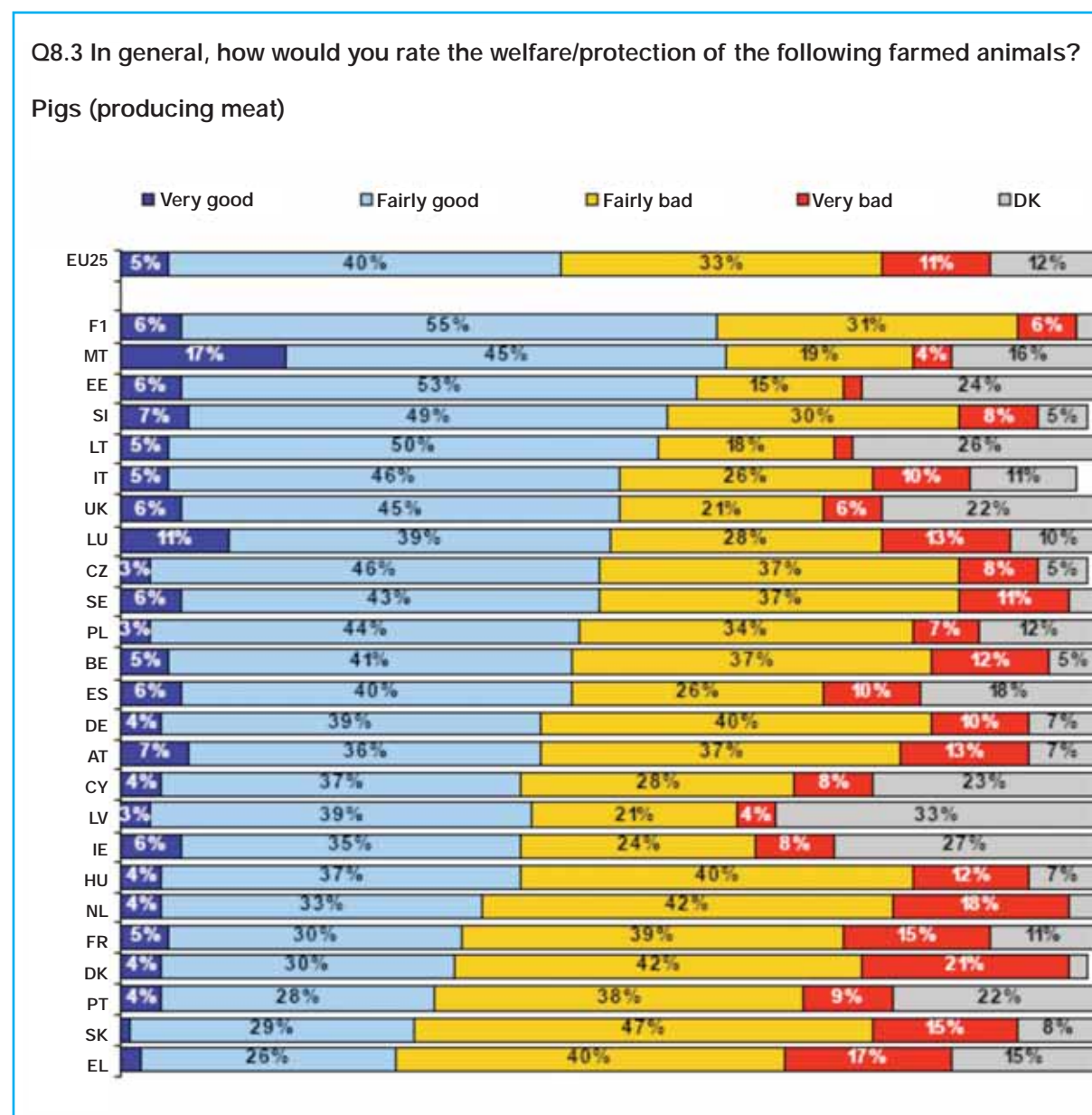
Two main factors seem to explain these findings: firstly, media coverage (which has focused more heavily on chickens than other types of livestock); and, secondly, the extent to which consumers can see these animals grazing or living in open fields. The fact that hens and salmon are generally out of sight means that they are also out of mind. The sight of cows, sheep and pigs living outdoors, sometimes in idyllic rural settings, convinces consumers that they must be leading a decent life.

In Europe, women (45%), younger people (47%) and more educated people (51%), - as well as those on the left of the political spectrum - are the harshest judges of pig welfare standards (Figure 37). ¹⁰⁸ Those rating pig welfare relatively highly are also more likely to live in a rural area (48%), or to have finished their education at 15 years of age or less (50%). Perceptions of UK standards of pig welfare compare favourably with those of our immediate neighbours, and better than the European average; however, several countries in the Nordic and Baltic regions (including Sweden and Finland) are perceived as being superior. Danish perceptions are notably worse than for both the UK and Europe as a whole.

¹⁰⁷ Ibid.

¹⁰⁸ Attitudes of Consumers Towards the Welfare of Farmed Animals, Eurobarometer, 2005.

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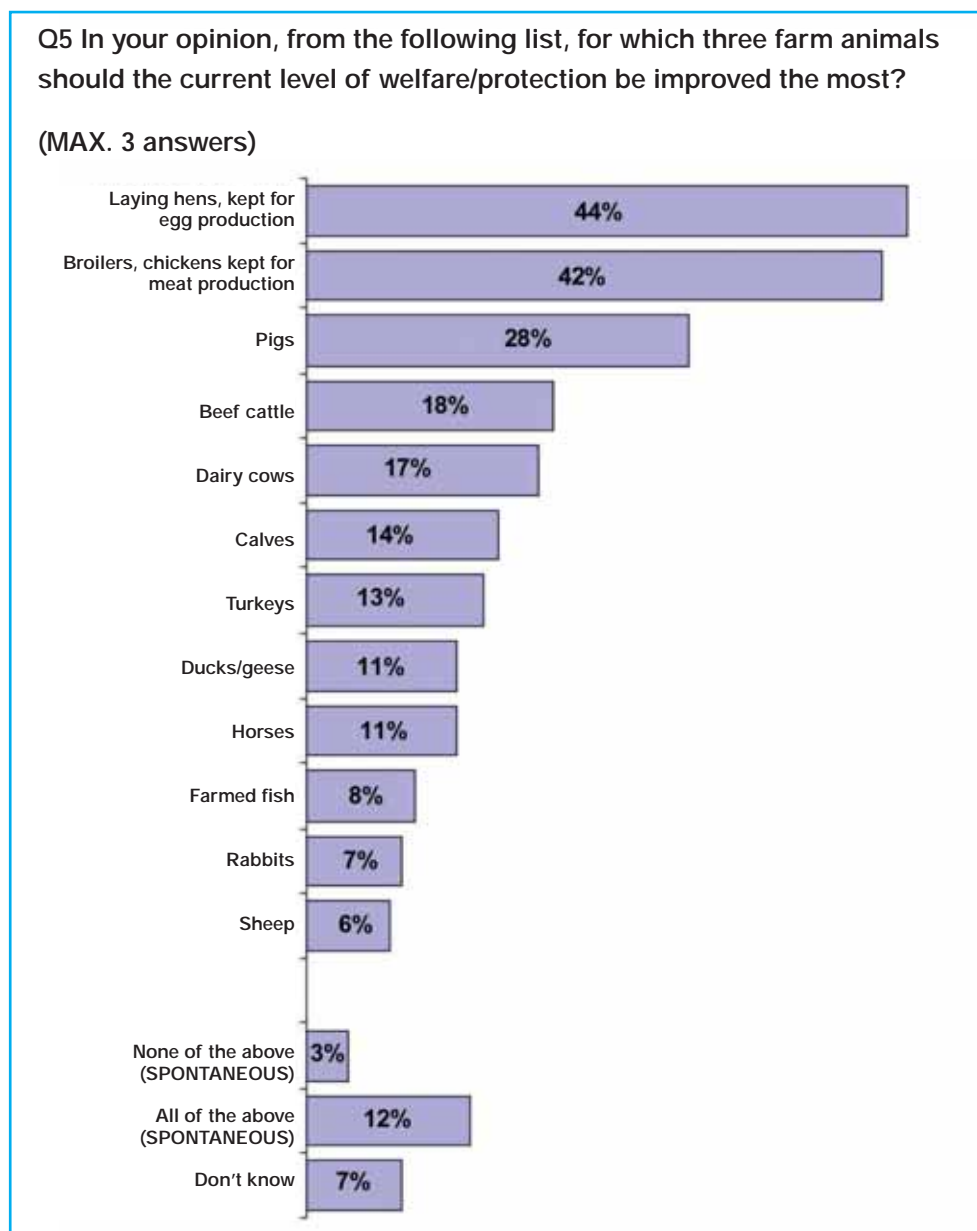
Animal welfare *cont'd*Figure 37 Perceptions of pig welfare in European countries ¹⁰⁹

There is no doubt that conditions for laying hens, broilers and pigs have all improved, and that these improvements have been noticed by consumers (Figure 38). However, the extent to which the data on perceptions of animal welfare, as reported in this chapter, reflect true levels of animal welfare is unresolved. Therefore, this data should be regarded as weaker than that contained elsewhere in this report.

¹⁰⁹ Ibid.

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Figure 38 Perceived need to improve welfare standards for selected breeds



There is, then, a tension between environmental impacts (which tend to be greater for livestock that is bred and reared outdoors) and perceptions of animal welfare (which tend to be higher for these same animals). Those who have visited a farm that rears animals are more optimistic about pigs' welfare than those who have never visited such a farm. However, 40% of those who have visited a pig farm continue to have concerns over pig welfare. ¹¹⁰

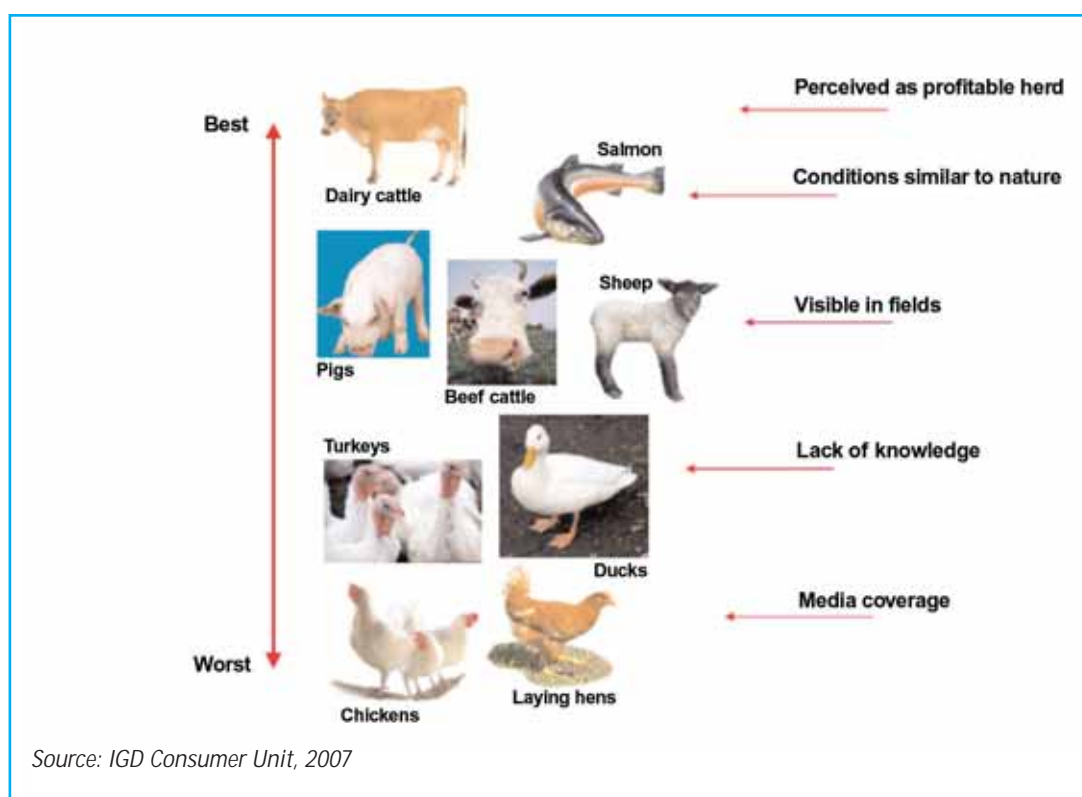
When asked which species they would prioritise when it came to welfare, consumers mentioned pigs less frequently than chickens. However, where welfare is perceived to be high, respondents mentioned pigs more often. For example, pigs were prioritised by a majority of Danish (60%), Dutch (52%) and Greek (50%) respondents. By contrast, only 19% of UK respondents and 17% of Italian respondents mentioned them. (This may reflect the higher rates of pork consumption in Denmark and the Netherlands).

¹¹⁰ Ibid.

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Animal welfare *cont'd*

Figure 39 Perceptions of animal living conditions (with drivers)¹¹¹



Sow gestation stalls/crates on intensive farms, which are so narrow that pregnant pigs cannot turn around, are now banned in the United Kingdom and Sweden, and will be partly illegal in the European Union in 2013.

6.2 Genetics

As discussed in 3.6.2, measures that use genetics to tackle GHG emissions might have unintended consequences for animal welfare. Compassion in World Farming (CIWF) cautions the following: "Genetics for increased robustness, for example [increased] longevity and decreased morbidity, are generally at odds with the recommendation to enhance productivity. In terms of welfare, intensification has gone too far. The 2007 opinion of the Animal Health and Welfare Panel of the European Food Safety Authority of the European Commission on fattening pigs concludes that genetic selection of pigs for rapid growth and lean meat without enough consideration of other factors has led to some widespread and serious problems, in particular leg disorders, cardiovascular malfunction when high levels of activity are needed or stressful conditions are encountered, and inadequate maternal behaviour (EFSA, 2007)... Another potential productivity measure, namely breeding pigs for larger litters, adds to the risk that the sow may not be able to sustain a sufficient milk supply. This risks a loss of condition for the sow and poor growth or starvation for some of the piglets. Selection for lower fat rates in pigs also risks producing a sow with insufficient reserves to sustain a lactation with similar welfare consequences. As a general rule, selection for higher food conversion efficiency in pigs, poultry and dairy cows has gone further than is consistent with health and welfare."

¹¹¹ Consumer Attitudes to Animal Welfare, IGD, 2007.

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6.3 Local adaptation of pig diets

CIWF suggests that more robust genetics will be needed to produce animals that are better adapted to locally produced diets and alternative feedcrops: "The more productive the animal, the more precise the nutrition needs to be, especially in regard to amino acid balance, hence the need for soya. A more robust but less productive animal, on the other hand, has more adaptability and is likely to be better able to maintain health and production on a locally produced diet."

This may compromise the technical feed efficiency ratio of herds, so products that conform to these higher welfare standards need to be able to command higher prices in the shops. An obvious way of achieving this is to encourage the development and marketing of free-range, outdoor bred/reared and organic pig products.

To also ensure future incomes for indoor farmers, it is vital to develop high welfare indoor systems, such as those conforming to RSPCA Freedom Food standards, which can be advertised on pack. According to CIWF, these will require the development of:

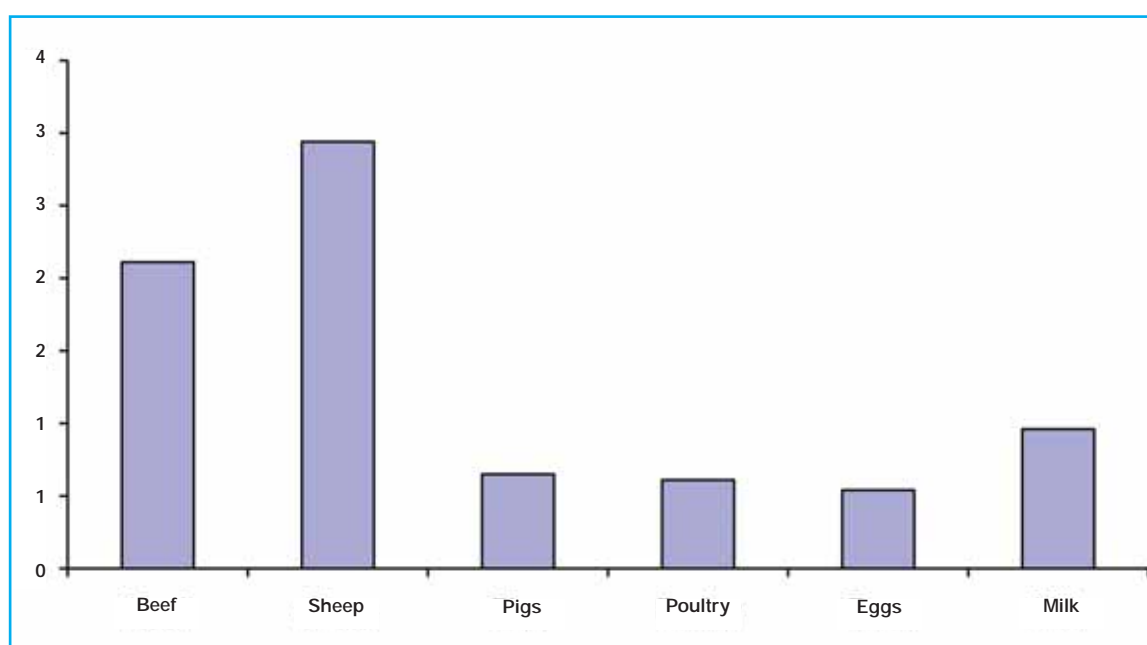
- Free-farrowing systems that can be managed without high piglet mortality
- Straw-bedded systems for growing pigs, which can be managed with low levels of tail-biting without docking tails.

According to BPEX, tail biting is a problem that tends either to be completely absent or a significant problem, depending on the pig population in question. BPEX is conducting research into the causes of tail biting, which, it says, are still not well understood.

7 Land use and amenity

70% of Britain is covered by farmland – a high proportion when compared with other countries (see Chapter 1). Species that occupy grassland take a disproportionately high share of this, because this land is often marginal and not suitable for growing other crops or species. For this reason, sheep and beef occupy the most land, whereas pigs and poultry, which are raised on land that can also be used for a variety of other agricultural purposes, take up less. The land use attributed to the products of live animals, such as milk and eggs, is even lower, because it is used over a longer time span. (See Figure 40 to compare the different amounts of land taken by the respective meat species and animal products with relation to weight of product produced).

Figure 40 Land use per tonne produced (hectares)



Of course, the amount of land used by each species or product is not the only consideration. Many of us have grown up in the heart of this farmland, or used it as a welcome escape from the city. Many of our traditions and rhythms arise from the types of agriculture that we practice and the types of landscape that it produces. Our names are often references to agricultural activities,¹¹² as are elements of our art and music. Our traditional diet is based on what we have traditionally grown, and when we have grown it.

Major shifts in agriculture and horticulture produce major shifts in the appearance of our landscape; in considering how to alter the mix of production, it is important to consider how people may be affected by such changes. For example, they may be required to learn new skills, to accept changes in the appearance of their landscape or to change their consumption habits.

¹¹² www.bbc.co.uk/wales/whatsinaname/sites/themes/pages/industry.shtml

8 Food security

There is currently enough food in the world (in terms of calories per capita) to feed the entire global population (although inequity forces some to go hungry). However, the Government's Chief Scientific Adviser has warned that this is unlikely to remain the situation. He anticipates a "perfect storm" of "rising demand, stagnant production and climate change".¹¹³ Already the effects of climate change, allied with competition from biofuels, are placing great strain on the ability of the human population to feed itself.

In its recent report "Food Security and Sustainability: The Perfect Fit", the SDC concludes that there is an "ideal fit" between sustainable development and food security. It recommends that the very definition of food security be broadened to acknowledge the need to feed everyone sustainably, equitably and healthily, and to address the needs for availability, affordability and accessibility. Such a system would be "diverse, ecologically sound and resilient", and would build on the capabilities and skills necessary for future generations. The authors recommend that Defra and devolved authorities assess the relative and absolute contributions of the major food groups (including meat and dairy) to home consumption, environment, employment, economy and health, with a view to maximising self-sufficiency. Measures would include: updating Defra's soil strategy to give greater priority to domestic production capacity; providing more and better jobs in food production and advice systems; co-ordinating government advice on diet with sustainability in mind; and creating a new Common Sustainable Food Policy.

As the global population rises to an estimated 9 billion people by 2050, and as rising incomes generate increased demand for food, global food consumption is set to increase. The World Bank estimates that, in order to meet this future demand, cereal production needs to increase by 50% and meat production by 85% by 2030¹¹⁴ (compared with 2000). Since the growing human population will need to be housed, the competition for land between human living space and agricultural production will be increasingly strained, and there will be pressure for dramatic gains in agricultural productivity.

Food production, particularly of meat, will come under further pressure from measures to tackle climate change, both because it is a major source of GHGs and because it can compete for space with important carbon sinks, such as rainforests. For example, Defra's working group on Food Security includes climate change and other aspects of sustainability within its remit.

The United Nations Environment Programme recommends the following strategies for enhancing food security in an environmentally sustainable way:

- **Short term:**
 - Regulate commodity prices and larger cereal stocks to reduce the volatility of prices due to market speculation. Examples of how to do this are given, such as a global fund to support micro-finance to boost small-scale farmer productivity
 - Encourage removal of subsidies and blending ratios of first generation biofuels, which would promote a shift to higher generation biofuels based on waste. This would prevent biofuels being grown on land that could be given over to wildlife, or to feeding people and animals.

¹¹³ Speech to UK Sustainable Development 2009 conference, 2009. Beddington, quoted in "Food Security and Sustainability: The Perfect Fit", SDC, 2009.

¹¹⁴ World Development Report 2008, World Bank.

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Food security *cont'd*

- **Medium term:**
 - Reduce the use of cereals and fish in animal feed, and develop alternatives to animal and fish feed
 - Support farmers in developing diversified and resilient eco-agriculture systems that provide critical ecosystem services (water supply and regulation, habitat for wild plants and animals, genetic diversity, pollination, pest control and climate regulation, as well as adequate food to meet local and consumer needs). This includes: managing extreme rainfall; using inter-cropping to minimise dependency on external inputs, such as artificial fertilisers, pesticides and blue irrigation water; the development, implementation and support of green technology for farmers at all scales of production
 - Increase trade and improve market access by improving infrastructure and removing trade barriers. [This does not imply a completely free market approach, as price regulation and government subsidies are seen as crucial safety nets for investors.]
- **Long term:**
 - Limit global warming, including the promotion of climate-friendly agricultural production systems and land-use policies at a scale to help mitigate climate change
 - Raise awareness of the threats of increasing population growth and consumption patterns to ecosystems.

9 Consumers and retailers

Many consumers consider meat and dairy products to be nutritious, wholesome parts of every day life, deeply embedded in the British culture and in many resident ethnic communities. At the same time, many have cut down on the amount of meat they eat, for health reasons. Most recently, the question of how meat consumption might drive climate change has also entered the public arena, following calls from J.K. Pachauri, Sir Nicholas Stern and other prominent and respected public figures, for people to eat less meat. On the one hand, retailers view fresh meat as a key area for attracting shoppers, and shoppers judge the quality and value of a store by the quality and value of its fresh meat section. On the other hand, eating too much meat has become associated with health problems, and, increasingly with climate change.

Retailers are currently struggling to resolve these conflicts. They would like to find a range of products that both contain meat and have low environmental footprints, but a growing scientific consensus calls this possibility into question. Their most likely response will be to give their customers some indication of the environmental (probably GHG-related) impacts of individual products, directly on the pack. Tesco already carries over a hundred products with carbon labels, although many other types of label might be used. Each of the Tesco/Carbon Trust labels tells the customer how much carbon is “embedded” in its respective product. Tesco acknowledges that the absolute number on the carbon label means little to most of its customers, but it is convinced that most customers appreciate the fact that it is there, and think better of Tesco for providing it. Of more importance to environmental campaigners and policy makers is that the carbon label entails a commitment to measure and reduce the product’s carbon footprint.

Other retailers have been reluctant to use such labels, preferring to edit consumers’ choices before the products reach the shelves.

Retailers are also increasingly likely to run promotions that feature environmentally friendly products or families of products.

All major retailers have extensive climate change-related programmes, and are looking at how their policies and practices (including “choice editing”, “choice influencing” and guidelines for meat suppliers) might be altered in the interests of sustainability.

9.1 Choice editing and influencing

Given, on the one hand, the British shopper’s love of meat, and, on the other, meat’s relatively high contribution to environmental impacts, retailers and food brands are faced with a series of dilemmas. Here are some of the decisions that they face:

- Should they attempt to reduce volume sales of meat? If so, could they compensate for lower volume sales by adding more value?
- Should they reduce the meat content of pre-prepared foods?
- Should they reduce the sizes of meat portions?
- Should they attempt to persuade shoppers to choose lower impact meats, such as pork and poultry, instead of beef or lamb (and how does one define “lower impact”, given the complexities described in this report)?
- Which, if any, environmental labels should they put on their products, and what methodologies should they use for these labels?

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Consumers and retailers *cont'd*

9.2 Green claims

The concept of sustainability is a systemic one: the sustainability credentials of any particular product, company or sector depend not on absolute levels of emissions (even over entire lifecycles) but on their contribution to the overall sustainability of the broader socio-economic system. So, it is not credible or valid to claim that any product, company or sector is inherently “sustainable”. Instead, it is better to inform the public of how these units perform across a range of sustainability criteria.

Exactly what to claim is a challenging question for marketers. The proliferation of green claims across diverse market sectors, from household products to air travel and tourism, has led to increasing scepticism about environmental messaging among consumers and key influencers.

At the same time, the concept of “greenwash” has received significant media attention in mainstream publications. (“Greenwash” is the practice of misleading consumers about the nature or extent of the environmental credentials of a product or service.) Public complaints to the Advertising Standards Authority (ASA) have risen sharply in recent years: in 2006, the ASA received 117 complaints about environmental claims in 83 advertisements; in 2007, there were 561 complaints about 410 advertisements – almost a 500% increase. As complaints have risen, the ASA has noticed a number of recurring issues. The most common claims being challenged are carbon-reduction claims, cradle-to-grave claims and claims about green energy sources.¹¹⁵

Defra/BERR offers advice on green claims to advertisers and consumers, in the form of the Green Claims Code (GCC).¹¹⁶ This was developed in 2003, and outlines current UK and EU legislative requirements and codes of good practice. It also offers sector-specific guidance (including for food) on how to make self-declared environmental claims. It provides principles for best practice that cover unambiguous terminology, accuracy and guidance around terms such as “sustainable” and “environmentally friendly”. The GCC is also referenced in the Committee of Advertising Practice (CAP) Code which is enforced by the Advertising Standards Authority’s (ASA) self-regulatory system.

However, the GCC has become outdated because of advances in scientific and consumer understanding of environmental issues and because of the appearance of new claims, such as “carbon positive”. Furthermore, new and different concerns have risen up the environmental agenda and are being used by businesses in advertising campaigns. Consumers International and Consumer Focus (formerly the National Consumer Council) report that many consumers also remain confused about which products are better for society and the environment.¹¹⁷

For these reasons, Defra has begun a new project – in association with the advertising and marketing sector – to develop a new version of the code.¹¹⁸

¹¹⁵ Defra.

¹¹⁶ www.defra.gov.uk/environment/business/marketing/glc/code.htm

¹¹⁷ Sustainable Consumption Facts & Trends to 2050, WBCSD, 2008.

¹¹⁸ This project is being commissioned under Defra’s Sustainable Consumption and Production (SCP) Evidence Programme.

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9.3 Labels

The products available in today's supermarkets carry a wide range of labels, on-pack claims and elements of design that are meant to inform and reassure consumers on health, safety, environmental impacts or social concerns. Several brands, including grocery retailers, have developed their own labels; other brands use third party labels and endorsements or on-pack claims. ¹¹⁹ Claims of "natural" and "organic" are common. However, for many of the reasons mentioned in the previous section, consumers remain sceptical: 64% of them want third-party verification of such claims. ¹²⁰ Such verification is sometimes offered by third-party labels, covering: "organic" (e.g. USDA, Rainforest Alliance, Soil Association); "healthy" (e.g. National Heart Foundation Approved, Low Glycemic Index/gluten free); "sourced from sustainable sources" (e.g. Forest Stewardship Council, Sustainable Forestry Initiative, Marine Stewardship Council); "ethically sourced" (e.g. Fairtrade); and "eco-friendly" (e.g. EU "Flower"). Producers are also obliged to provide nutritional values and a full list of ingredients.

These and other labels, such as the new carbon label, can play an important role in fostering sustainable consumption when used as part of a package of measures, including consumer education and commitments to reduce impacts over time.

Furthermore, Defra's project to update the Green Claims Code (see above) should help to improve the quality and usefulness of any labels that are used in future.

¹¹⁹ Facts & Trends on Sustainable Consumption from a Business Perspective, WBCSD, 2008.

¹²⁰ GfK Roper.

10 Recommendations

The recommendations in this section are based on the data and insights contained in this report, and take into account the two main (non-commercial) roles of BPEX: to support policy makers; and to develop and transfer expertise and technologies to the pork industry. They also take into account BPEX's obligation to take account of the needs of consumers, as well as BPEX's relationships with other organisations, both within and outside the AHDB.

For convenience, key recommendations are given in section 10.1. Specific recommendations are then given for: measuring and reporting; feed; agricultural systems; waste; biofuels; water; markets and public policy; international co-ordination and management; consumers, diet and health; and animal welfare.

10.1 Key recommendations:

BPEX should continue and expand its efforts to enhance the environmental sustainability of the pork system by:

- Focusing less on maximising production as an end in itself and more on assuring that the UK's demand for pork is met sustainably from domestic production
- Developing, with Defra, a Pork Roadmap, similar to those for dairy and (soon) beef
- Further expanding research on environmental impacts other than GHG emissions, including water resources, biodiversity, acidification, eutrophication, abiotic resource use and waste.

10.2 Measuring and reporting

- Continue and expand work with sister organisations and academics (currently Cranfield University) to analyse, record and report publicly the environmental impacts of UK pork production and consumption, including comparisons between key markets of production and consumption.

10.3 Feed

- Create a programme of development – including funding, guidance and communications – to help reduce the impacts of soya used in pig feed. Specifically:
 - Join (or encourage members to join) the Round Table on Responsible Soy (RTRS) and make a public commitment to its principles of sustainable soya production
 - Make feed companies and the supply chain aware of how and where to source RTRS soya
 - Conduct – or help producers and retailers to conduct – a detailed audit of soya types used in supply chains, with specific reference to deforestation and other key environmental impacts
 - Communicate regularly to retailers, consumers and government the proportion of RTRS soya used in the production of English pork, comparing this, where possible, with pork produced in other countries

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- Encourage producers to set time-specific targets for minimum proportions of RTRS soya, and encourage them to move towards a commitment to sourcing 100% RTRS soya by a specific date
- Support, through communications and advice to government, a re-framing of the debate about soya away from GM and towards deforestation.
- Continue and expand research and development, and knowledge transfer, with relation to alternative feed stocks with improved environmental impacts. Specifically:
 - Accelerate and broaden research on lupines, rape, peas, beans and other alternative feed crops
 - Support the approval at EU level of the use of meat and bonemeal, provided that this is proved to be safe
 - Continue to support advancements in the use of genetics to enhance feed conversion rates and longevity, and to reduce morbidity.
- Explore further opportunities and barriers to the use of waste, by-products and co-products from the human food chain. Where possible and appropriate, support local authorities and central government in the development of an effective, efficient system to collect and treat such waste so that it may safely be used in pig feed. (Currently, safety cannot be assured; the question of safety in pig feed has not been explored in this report, but merits further consideration.)
- Explore how changes in animal diet affect manure production, then support and promote the introduction of more environmentally beneficial diets
- Encourage Defra to develop outcomes of the Pig Supply Chain Task force beyond profitability, to include environmental (and social) impacts.

10.4 Agricultural systems

- Compare and contrast the impacts and benefits of industrial (intensive) vs. integrated (extensive) farm systems from a range of social, environmental and ethical perspectives; formulate a view on how the best qualities of each can be used to inform agricultural system change in the UK, bearing in the mind the needs and preferences of consumers
- Consider the relative implications of outdoor and indoor rearing for the full range of sustainability criteria, as described in Chapters 1 and 2.

10.5 Waste

- Support the government and local authorities in their efforts to develop and roll out more cost-effective means of developing biogas from anaerobic digestion; promote these technologies to farmers and industry where appropriate
- Support work to reduce waste from farming, processing and consumer use of pork products and packaging. (Consider both technological and educational solutions)
- Support the development of lower-impact packaging, such as new packaging materials and information for consumers about the disposal of packaging
- Encourage home and local authority composting of unavoidable food waste (see 9.2).

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10.6 Biofuels

- Support efforts to encourage feed importers, farmers, processors, retailers and hauliers to increase the proportion and efficiency of “second-generation” (or higher-generation) biofuels in their operations
- Support the work of the Roundtable on Sustainable Biofuels (RSB) and the adoption and testing of RSB draft standards.

10.7 Water

- Analyse and manage – in association with environmental experts, local authorities and other organisations, where appropriate – the embedded water content of pork products.

10.8 Markets and public policy

- Support the reform of the Common Agricultural Policy to take account of environmental impacts, including climate change, biodiversity and water quality
- Encourage producers, processors and retailers to participate in (and, where necessary, improve) the EU's Emissions Trading Scheme
- Support the efforts of the UK government, the EU and UNEP to enhance food security in the UK and abroad
- Support efforts to improve and reform the broader system of production and consumption, including enhancements to the EU's Emissions Trading Scheme
- Support forthcoming efforts in Copenhagen to achieve a globally binding commitment and strategy to reduce overall carbon emissions.

10.9 Internal co-ordination and management

- Work with sister organisations within the AHDB to develop “joined-up” thinking on environmental impacts. (This should take into account synergies between different food types and agricultural techniques)
- Encourage the AHDB to instigate a project to further understand and maintain stasis in the nitrogen cycle
- Work with sister organisations around the world to develop a vision of a sustainable global food system.

10.10 Consumers, diet and health

- Work with others to explore further the links between diet, human health and environmental impacts, so that retailers and consumers can make informed purchasing decisions
- Help to educate consumers on the most efficient ways of storing and cooking food that contains pork products
- Join the debate over appropriate (sustainable) levels and types of meat consumption and ways to achieve them

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- Help retailers and consumers to choose and use pork products sustainably
- Help guide the formulation of the UK Government's new Green Claims Code.

10.11 Animal welfare

- Consider how to allow members of the public to view all activities during the lives of livestock (without compromising bio-security).

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Appendix I: Selected sources

Title	Author	Publisher	Date
AHDB's comments on the first draft of WWF-UK's One Planet Food Strategy document	AHDB	Unpublished	2009
An Assessment of the Environmental Impacts of UK Food Consumption	Donal Murphy-Bokern	Murphy-Bokern Konzepte	2008
An inconvenient truth about food: Neither secure nor resilient	Soil Association	Soil Association	2008
Appetite for Change	National Trust		2009
Attitudes of Consumers Towards the Welfare of Farmed Animals	Eurobarometer	Eurobarometer	2005
Consumer attitudes to welfare	The Food Strategy Project Group	IGD	2007
Cooking up a Storm: Food GHGs and our changing climate	Tara Garnett	FCRN	2008
Determining the environmental burdens and resource use in the production of agricultural and horticultural commodities	Williams, A.G., Audsley, E. and Sandars, D.L.	Cranfield University/Defra	2006
Food Futures: Rethinking UK Strategy	Ambler-Edwards, Bailey, Kiff, Lang, Lee, Marsden, Simons, Tibbs	Chatham House	2009
Food Matters	Cabinet Office		2008
Foresight Food and Farming Workshop: Defining and developing the questions to take into research	Henley Centre Headlight Vision	Henley Centre Headlight Vision	2008
Global Trends in Meat Production: implications for the UK	Proceedings of the British Society of Animal Science	British Society of Animal Science	2009
Globalization of Water: Sharing the Planet's Freshwater Resources	Hoekstra and Chapagain	Blackwell	2007
International comparison of greenhouse gas emissions from livestock and implications for trade	Gareth Edwards-Jones and K. Plassmann	School the Environment & Natural Resources, Bangor Uni	2009
Livestock-related greenhouse gas emissions: impacts and options for policy makers	Tara Garnett	Elsevier/FCRN, Centre for Environmental Strategy, University of Surrey	2009
Livestock's Long Shadow	LEAD	FAO	2006
Living Planet Report, 2008		WWF	2008
Meat & Dairy Production and Consumption: Exploring the livestock sector's contribution to the UK's greenhouse gas emissions and assessing what less greenhouse gas intensive systems of production and consumption might look like	Tara Garnett	FCRN	2007
Meat costs the climate but mitigation isn't simple	Garnett	Food Ethics Magazine, Vol 2, Issue 4	2007
Millenium Ecosystem Assessment: Ecosystem Services and Wellbeing	MEA	MEA	2005
One Planet Food Strategy	WWF-UK	Unpublished	2009
Press release on Covalence Food & Beverages Report, 2008	Covalence	Covalence	2009
Prosperity with growth?	T Jackson	SDC	2009
Red Meat in the Australian Environment	Meat & Livestock Australia	Meat & Livestock Australia	2008
Scoping Lifecycle Assessment of Pork Production	ERM		2009
Special Briefing: International Assessment of Agricultural Knowledge Science and Technology for Development (IASTD) - meeting the challenge	Practical Action, GM Freeze and Friends of the Earth		2008
Strategies for Reducing Red Meat and Dairy Consumption in the UK	Jackson, Lee-Woolf, Higginson, Wallace, Agathou	Imperial College (unpublished)	2009
Sustainable Consumption Facts & Trends from a Business Perspective		WBCSD	2008
Sustainable Food Laboratory Foundation Workshop Learning History	Susan Sweitzer	Sustainable Food Lab	2004
The Corporate Climate Communications Report, 2007		SGS/CorporateRegister.com	2008
The Environmental Food Crisis			
The Environmental Impacts of Livestock Production		Defra	2008
The Food We Waste	WRAP	WRAP	2008
The Global Benefits of Eating Less Meat		Compassion in World Farming	
The Rebound Effect	UK Energy Research Centre		2007
Thinking about the Future of Food	Chatham House Food Supply Project	Chatham House	2008
Vision for a Sustainable Food Chain: Workshop Report		Sustainable Development Commission	2009
Watching water: A guide to evaluating corporate risks in a thirsty world	Levinson, Lee, Chung, Httner, Danely, McKnight, Langlois	JP Morgan	2008
Water footprint: The impacts of the UK's food and fibre consumption on global water resources. Volume 1	Orr and Chapagain	WWF-UK	2008

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Appendix II: Water data

Virtual water content of livestock products	VWC(m3/ton)	GrpFAO
Bovine and equine leather, full/split grains, nes	16646	Bovine
Bovine and equine leather, nes	16656	Bovine
Bovine and equine leather, tanned or retanned, nes	16646	Bovine
Bovine carcasses and half carcasses, fresh or chilled	11001	Bovine
Bovine cuts bone in, fresh or chilled	11001	Bovine
Bovine cuts bone in, frozen	11001	Bovine
Bovine cuts boneless, fresh or chilled	15497	Bovine
Bovine cuts boneless, frozen	15497	Bovine
Bovine edible offal, fresh or chilled	11535	Bovine
Bovine edible offal, frozen nes	11457	Bovine
Bovine hides, whole, fresh or wet-salted	8303	Bovine
Bovine leather, otherwise pre-tanned, nes	16646	Bovine
Bovine livers, edible offal, frozen	5637	Bovine
Bovine meat and meat offal nes, excluding livers, prepared or preserved	20382	Bovine
Bovine skin leather, whole	16656	Bovine
Bovine skins, whole, raw	6632	Bovine
Bovine, live except pure-bred breeding	6944	Bovine
Bovine, live pure-bred breeding	6944	Bovine
Butts and bends, bovine, fresh or wet-salted	8303	Bovine
Hide sections, bovine, nes, fresh or wet-salted	8303	Bovine
Goat or kid hides and skins, raw, nes	4230	Goats
Goat or kid skin leather, nes	4722	Goats
Goat or kid skin leather, otherwise pre-tanned	4722	Goats
Goat or kid skin leather, tanned or retanned, nes	4722	Goats
Goats, live	2350	Goats
Horsehair & waste put up or not as a layer with or without supg material	7130	Horse
Horses, live except pure-bred breeding	3157	Horse
Horses, live pure-bred breeding	3157	Horse
Egg yolks dried	8364	Layer
Eggs, bird, in shell, fresh, preserved or cooked	3340	Layer
Eggs, bird, not in shell, dried	4950	Layer
Animal fats & oils & fract hydrogenated, inter/re-esterifid, etc, ref	7800	Livestock nes
Animals, live nes	6944	Livestock nes
Articles of leather or of composition leather, for technical uses	16646	Livestock nes
Articles of leather or of composition leather, nes	16646	Livestock nes
Chamois (including combination chamois) leather	16646	Livestock nes
Composition leather, in slabs, sheets or strip	16646	Livestock nes
Guts, bladders and stomachs of animals except fish whole or in pieces	11535	Livestock nes
Homogenised preparations of meat and meat offal	20382	Livestock nes
Leather, nes	16656	Livestock nes
Livers of any animal prepared or preserved	5637	Livestock nes
Meat and edible meat offal, nes fresh, chilled or frozen	11535	Livestock nes
Meat, meat offal or blood, prepared or preserved, nes	11535	Livestock nes
Parings and other waste of leather; leather dust, powder and flour	16646	Livestock nes
Raw hides and skins of animals, nes	6632	Livestock nes
Sausage & sim prod of meat, meat offal/blood & food prep basd on these prod	11535	Livestock nes
Veg fats & oils & fractions hydrogenated, inter/re-esterifid, etc, ref	7800	Livestock nes
Butter	4914	Milk
Buttermilk, curdled milk & cream, kephir & ferm or acid milk & cream nes	1494	Milk
Cheese nes	4914	Milk
Cheese processed, not grated or powdered	4914	Milk
Cheese, blue-veined	4914	Milk
Cheese, fresh (including whey cheese) unfermented, and curd	3094	Milk
Cheese, grated or powdered, of all kinds	4914	Milk
Dairy spreads	4914	Milk
Fats and oils derived from milk nes	4914	Milk
Milk and cream nes sweetened	1846	Milk
Milk and cream not concentrated and unsweetened exceeding 6% fat	1841	Milk
Milk and cream powder sweetened exceeding 1.5% fat	4612	Milk
Milk and cream powder unsweetened exceeding 1.5% fat	4602	Milk
Milk and cream unsweetened, nes	1542	Milk

Source: WWF-UK, 2009

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