



Agri-technologies: what the public say



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This report is a review of information on the views and values of the public on agri-technologies available at time of writing, April 2014. It provides a snapshot of public views and is a live document, open to comments and additions.

The report will be useful to those interested in the public's views on new and emerging areas of science and technology and is particularly targeted to assist those involved in policy involving science and technology as they provide a background to what is already known about public views.

It is worth noting that this report focuses on a high-level account of public views summarised across various different engagement methodologies. It does not intend to capture the nuances or reasoning behind those methodologies.

The views and values of the public will change and new information will become available. Hence, we welcome your views, insights or comments.

- Do you know of further evidence which we should include?
- Do you have any comments or suggestions to improve the report?

You can comment [here](#).

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Sciencewise is a BIS funded programme to encourage the more widespread use of public dialogue in policy involving science and technology. Sciencewise provides advice and guidance to help those involved in the development of policy to understand and to take into account the views and values of the public in the development of policy involving science and technology. Sciencewise is able to provide:

- Advice and guidance on public dialogue and engagement.
- Assistance with the implementation of engagement as appropriate
- Financial support for the implementation of selected public dialogue projects
- Training and mentoring to assist those involved in policy development to build their understanding of the benefits and their confidence around engagement with the public.

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1 Executive Summary

Food production is the UK's biggest single manufacturing sector, responsible for 7% of national output. In 2012 agri-science was identified as one of the eight great technologies that have the potential to contribute to UK's growth. In 2013 the UK agricultural technologies strategy was published.

This report looks at the public views about the the food and farming supply chain and areas of significant agri-technology research¹: crop and livestock genomics, genetics, plant breeding, industrial and synthetic biology nutrition, human nutrition, functional foods, nutraceuticals, agri-engineering, health in crops and livestock, environmental sciences, clean technology and energy generation from waste, food science.

This research has highlighted the complexity and diversity of public views in this often highly contentious area of science and technology. As a result of the breadth of issues and views, this report presents a headline summary of the main findings of a variety of public views sources over the last 5-10 years.

Feeding a larger and wealthier population is perceived as a priority issue by the UK public although that does not necessarily imply support for increasing food production. Possible solutions in other aspects such as better food distribution and waste management and behavioural changes are seen to have a relevant role in tackling this challenge.

Agriculture is considered to be beneficial for the environment, contribute to the beauty of the countryside and help to preserve and protect rural areas. There are concerns about depletion of resources and competition for land between residential, agricultural and other uses.

Mostly there is support for new agri-technologies, especially when they are framed as addressing specific societal needs. There are some technologies that have scarce information about public views, such as functional food and nutraceuticals and agri-engineering.

In addition to specific views for each area, recurrent issues raised by the public are:

- for all topics the public referred to the need to have **adequate anticipatory regulation and monitoring** in place.
- concerns about “**unnaturalness**” of technologies are common for most technologies addressed, including uncertainty of long term health and environmental consequences, decrease of human contact with increased use of robotics, landscape changes and the perception that local/national and free range/ organic products are better quality, better for the environment and promote social equity.
- The **lack of confidence in industry** to care for wider societal needs is widespread.
- Often the public asks about the **trade-offs** between new technologies' potential risks and benefits; and how they compare with other possible solutions.

Some evidence shows that local products and farmer markets are more trusted by some than processed products and supermarkets to provide better quality and animal welfare and to have more positive environmental and social impacts. This is likely to be ingrained in any discussions involving agri-technologies and the role of business.

There is a gap in knowledge about the public segments' preferences and trade-offs when comparing different technologies and approaches that tackle the challenge to feed the world population of 9 billion by 2050.

Polls and surveys are not able to capture nuanced public views and how different groups might have different preferences and questions. Approaches such as deliberative dialogues or perhaps focus groups would be more suitable and should consider:

- a clear framing of the societal need

¹ [UK strategy for agricultural technologies](#), December 2013

- information about specific technologies; how they can contribute to societal needs, what is different or better about them when compared with other possible solutions, including behavioural change, waste and distribution management and other technologies in development; what are their potential risks and benefits (including health, environmental, economic and quality impacts).
- Discussion of industry roles, opportunities for the public to get involved, regulation and monitoring (already in place or planned) and the perception of “naturalness”.

2 Introduction

In the late eighteenth century, the UK led the Agricultural Revolution and has remained at the forefront of agricultural research. Nowadays food and drink production is UK’s biggest manufacturing sector, responsible for 7% of national output. The tomato industry alone is worth £625m annually.

The UN forecasts that global food production will need to increase by over 70% by 2050. To tackle this challenge, the aim set by the UN for the next 30 years is:

Sustainable intensification of agriculture – raising the productivity of agriculture, while protecting the environment, including biodiversity, and contributing to the mitigation of climate change.

The sustainable intensification of agriculture has many elements including crops and livestock research and the development of advanced agri-technologies. It is in this context that in 2012 Chancellor of the Exchequer George Osborne addressed the Royal Society and challenged the scientific community of Britain to lead the world in eight great technologies, one of which was agri-science.

Minister of State for Universities and Science David Willetts identified the need to improve the transfer of advances from agricultural research to the working farmer and to attract capital investment in domestic agriculture:

“The adoption of new technologies is crucial for improving agricultural productivity and feeding the world at a price we can afford.” David Willetts, 2013

This report looks at published and evidence based public views on areas of agri-tech research as mentioned in the UK Strategy for agricultural technologies² and about the food and farming supply chain more generally. It uses the *RCUK Public Dialogue Review* findings and recommendations to help find patterns in public views and consider potential public concerns when there is not much information available.

Agri-tech is a vast area and it is acknowledged that there are research areas and perspectives that it has not been possible to address to date, namely soil, aquaculture and wild caught fisheries, horticulture, pollination and the international angle of agri-technologies and agriculture.

² [UK strategy for agricultural technologies](#), December 2013

Agricultural technologies

The agricultural technology research areas considered in this research are defined below. They were grouped considering the research done on public views, which often address a group of technologies rather than a specific technology. For ease of reference, we group some technologies together by theme (e.g. the environment, nutrition etc.).

Relating to: genetic improvement		
<p>Crop and livestock genomics</p> <p>Agricultural genomics: the application of genomics in agriculture to improve the production of crops and livestock.</p>	<p>Genetics</p> <p>The study of heredity (WHO)</p>	<p>Plant breeding</p> <p>The purposeful manipulation of plant species in order to create desired new types for specific purposes, by use of controlled pollination and/or genetic engineering.</p>
Relating to: nutrition		
<p>Human nutrition</p> <p>Human nutrition describes the processes whereby cellular organelles, cells, tissues, organs, systems, and the body as a whole obtain and use necessary substances obtained from foods (nutrients) to maintain structural and functional integrity.</p> <p>(Introduction to Human Nutrition, The Nutrition Society Textbook Series 2009 p2)</p> <p>Good nutrition – an adequate, well balanced diet combined with regular physical activity – is a cornerstone of good health. Poor nutrition can lead to reduced immunity, increased susceptibility to disease, impaired physical and mental development, and reduced productivity.</p> <p>(WHO)</p>	<p>Nutraceuticals</p> <p>Extract or food that provides physiological benefits or protection against a chronic disease/delay aging/increase life expectancy, in addition to their basic nutritional value.</p> <p>Functional foods and dietary supplements are types of nutraceuticals.</p>	<p>Functional foods</p> <p>Foods developed to have specific health benefits/benefits beyond nutritional functions. They are enriched or fortified (nitrification) and contain a bioactive compound. Eg: Vitamin D added to milk.</p>
<p>Agri-engineering (sensors, autonomous vehicles, robotics, precision agriculture)</p> <p>The application of many science disciplines and technologies (sensors, autonomous vehicles, robotics) to agriculture, to enable efficient production and processing for food, feed, fibre and fuels (eg robotic milking; robotic cultivation, precision agriculture).</p>		
<p>Food science The chemical, biological, and physical nature of food/food products in terms of quality, safety, and nutrition. The processing and storage of food and food-related products.</p>		
<p>Health in crops and livestock The balanced use of breeding, agrochemicals (pesticides, antibiotics, fertilisers, growth promoters) and technology improvements to increase yields, whilst ensuring production is sustainable and there are no negative health effects, either to humans, environment or animal.</p>		

Relating to: the environment

Environmental sciences

A multidisciplinary field integrating biological and physical sciences for the study of the environment and environmental problems: sources; reactions; transport; biological species in air, water and soil; human impact.

External forces, influences and conditions which affect life, nature, behaviour, growth and development of living organisms

Clean technology and energy generation from waste

Clean technology produces fuels and electricity with smaller environmental footprint and minimal pollution. More energy efficient technology includes renewable energy, green transportation, green chemistry, recycling and information technology. Energy from waste is the process of thermal breakdown of waste to generate energy (heat/electricity).

Industrial and synthetic biology design and engineer biologically based parts, novel devices and systems as well as existing natural biological systems. The development of synthetic biology by industry and engineering will ensure that research becomes more applied and commercially applicable.

3 Public views

The views of the public summarised below were identified using the sources detailed in Appendix 1. These sources of public views were identified through online research and conversations with key players active in the agri-science community. The review of media reporting is solely from 2013.

The public views on each agri-technology draw on different type of resources that are referred to in the tables and appendix.

3.1 Agriculture and agri-technologies

Feeding a larger and wealthier population is perceived as a **priority issue** by the public.³ There are concerns with the **global food system distribution**, in particular the waste of food when others do not have enough to eat.

In a 2013 discussion about agri-technology⁴, the public thought that the UK's science is currently not translated into practice on the farm as efficiently as it could be but also that "techno-fixes" are not always appropriate tools. There are concerns that new technologies might have unintended consequences and that both risks and benefits should be assessed more thoroughly.

The majority in a survey in the UK saw agriculture as beneficial for the environment, contributing to the beauty of the countryside and helping to preserve and protect rural areas.⁵ 59% strongly agreed and 27% slightly agreed with the statement "Britain should remain a strong farming nation" and a high percentage (75%) agreed that "without farming Britain would be a worse place".⁶

Although the availability of food is a priority for consumers as it is something they are concerned with on a daily basis, **this does not necessarily imply that increasing food production is also a priority**. 75% agreed that protecting the countryside was most important compared to 15% for cheaper food.⁷ There are also concerns about **depletion of resources** and competition for land between residential, agricultural and other uses⁸.

Behavioural changes were discussed as part of the background context of the agri-tech strategy – changes in diet, reducing food waste.⁹ There is an ingrained perception that the UK could easily grow all its own food and that individual actions, for example buying local or having an allotment, would help solve wider problems like climate change¹⁰.

3.2 A (science) media perspective on agri-tech

There are certain topics within food, farming and agri-tech that reliably get covered in the UK national media. These exist separately to the big scandals or rolling stories that occur a handful of times a year, like horsemeat entering the food supply chain unexpectedly or the ban on neonicotinoid pesticides, and are often simply coverage of new research published in peer reviewed journals. Many revolve around diet and nutrition, such as whether processed meat has health implications or the extent of the link between sugar and obesity, alongside accompanying analysis of whether food manufacturers should bear the responsibility for negative health impacts. High-tech, early stage research on engineered food such as GM field trials or lab-grown meat often will get a media airing, despite the great distance between the lab and the supermarket shelf. Beyond new research the impact of the weather, climate and unforeseen factors like emerging livestock viruses will routinely make the science and environment pages. While the regularity with which all the above topics are covered implies they remain in the public interest there are some topics, like GM crops, which receive heavy reporting as a product of having received intense media coverage in the past.

³ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK, 2013](#)

⁴ Cheltenham agri-tech discussion report, 'Farming for the future?', 2013

⁵ Europeans' Attitudes towards Food Security, Food Quality and the Countryside, Eurobarometer 2012

⁶ Public attitudes to agriculture, the farmed landscape and natural environment 2010

⁷ Public attitudes to agriculture, the farmed landscape and natural environment 2010

⁸ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK, 2013](#)

⁹ Cheltenham agri-tech discussion report, 'Farming for the future?', 2013

¹⁰ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK, 2013](#)

3.3 Public views on agri-tech research areas and on the food and farming supply chain

The 2012 *RCUK Public Dialogue Review* identified eight common responses from public participants, which were used in the following tables to frame the public views findings:

1. **Conditional support** for the area of research being discussed;
2. Desire to see **equitable distribution** of both potential benefits and potential risks;
3. **Business** participation in research process is welcomed. However, society as a whole rather than business should set public research agendas;
4. Desire to see research focused on **clearly articulated societal needs**;
5. Preference for targeting **incremental solutions** to societal challenges;
6. Valuing '**naturalness**' – that is scepticism of the value of high-tech solutions to complex social and environmental problems;
7. Focus on **value for money** (both in terms of the research and the envisaged applications of research); and
8. **Anticipatory regulation** of emerging technologies should be considered simultaneously with research and innovation of these technologies.

3.3.1 Genetic improvement

There is a wealth of information on this topic, much of which around genetically modified (GM) food, as captured in appendix. The summary below relies heavily on the [Sciencewise Review of public dialogues about genetically modified crops and food](#) (1994-2011). The Public Attitudes to Science 2014 notes that in regards to GM crops, feeling informed doesn't necessarily mean being informed, nor does it necessarily lead to more support for the technology

Conditional support. Review of public views is unable to paint a simple picture of public opinion, the diversity of which is impossible to capture. There is no evidence of overwhelming intrinsic opposition to GM. Public concerns are conditional.

Some do not like the idea of GM (largely on ethical grounds and because of concerns about longer-term unintended consequences), but if adequate checks are in place some are willing to see it as an option.¹¹

People would engage more with agri-science if GM crops were seen as one of many technologies being put forward to help improve food security¹².

¹¹ The Future of Food, Which? 2013

¹² Public Attitudes to Science 2014, Ipsos Mori

<i>Concerns</i>		
<p>Equitable distribution of both potential benefits and potential risks. & research focused on clearly articulated societal needs;</p> <p>The ‘need’ for GM was questioned and was seen as not having been demonstrated, especially given the potential risks and the availability of other options to solve specific problems.</p> <p>The risks to the environment and biodiversity from GM crops were very widespread concerns, even among those who had fewer worries about the ‘food safety’ aspects of GM.¹³</p> <p>It is noted that people would engage more if GM crops were seen as one of many technologies being put forward to help improve food security.¹⁴</p>	<p>Business participation;</p> <p>Questions were raised about how the UK can remain competitive and what might the merits or otherwise be of adopting GM.¹⁵</p> <p>Distrust on business participation is stated especially on the sources found before 2009 (see appendix). Comments on a 2013 Guardian article about GM¹⁶ indicate that this might still be a concern for a few (cynicism that good news GM stories are PR for Monsanto) although there is also indications of relief that the GM debate has moved on from corporations vs. activists.</p>	<p>Incremental solutions & ‘naturalness’ .</p> <p>The perceived “unnaturalness” of GM technologies is a key concern as is the potential hazards of GM food.¹⁷</p>
<p>Value for money</p> <p>A majority of UK consumers (74.5%) seems to be willing to purchase GM foods if they are cheaper than traditional foods.¹⁸</p> <p>It was suggested¹⁹ that although consumers want cheap food, the UK could focus on producing a premium product for which people will pay more. Another suggestion was that GM-free was valued by consumers and so added a premium to products.</p>	<p>Anticipatory regulation</p> <p>At the broadest level, people lack confidence in the ability of scientists, companies and governments to understand and regulate the myriad possible implications of new science and technology²⁰ .</p> <p>72% on a survey²¹ agreed that “You need a licence before you can plant genetically modified (GM) crops in the UK”.</p> <p>Government, rather than the private sector, was seen as appropriate to lead development and ensure robust regulation of these technologies although there was some distrust of government and multi-national companies, especially around willingness to listen to public worries.²²</p>	

¹³ [Sciencewise Review of public dialogues about genetically modified crops and food, 2011](#)

¹⁴ Public attitudes to science 2014.

¹⁵ Cheltenham agri-tech discussion report, ‘Farming for the future?’, 2013

¹⁶ Skinny genes – how GM food may help you stave off obesity, The Guardian, 13 March 2013

¹⁷ [Sciencewise Review of public dialogues about genetically modified crops and food, 2011](#)

¹⁸ Consumers and new food technologies, Trends in food science and technology 22 (2011)

¹⁹ Cheltenham agri-tech discussion report, ‘Farming for the future?’, 2013

²⁰ [Sciencewise Review of public dialogues about genetically modified crops and food, 2011](#)

²¹ Public attitudes to science 2011

²² [Sciencewise Review of public dialogues about genetically modified crops and food, 2011](#)

3.3.2 Industrial and synthetic biology

The research focused on the past 6 years (2009-2014) and the resources are two public dialogues, three surveys, one social intelligence report that summarises many of the previous reports and one media reporting (see appendix).

<p>Conditional support.</p> <p>The potential of synthetic biology to tackle food scarcity are inevitable in the face of climate change and increasing global demand for food is acknowledged, but there are fears about control, who benefits, health and environmental impacts, misuse and regulation.²³</p>		
<p><i>Hopes</i></p> <p>Research focused on clearly articulated societal needs;</p> <p>The public have high hopes for the possibilities presented by synthetic biology, particularly in the field of medicine.²⁴ Participants in dialogue activities also expressed a hope that the technology could be used to create wealth and improve the UK's economic competitiveness. Participants in a public dialogue demonstrated pride in the knowledge that British researchers would be pioneers in this new area.</p>		
<p><i>Concerns</i></p>		
<p>Equitable distribution of both potential benefits and potential risks.</p> <p>People surveyed in opinion polls felt they were not sufficiently informed to weigh up the risks and benefits of synthetic biology. In Public Attitudes to Science (PAS) 2011, 35% say they don't know about the risks and benefits of synthetic biology and in PAS 2014 91% still didn't feel informed about this topic, although those who felt informed, although it seems that those informed are more favourable to this technology .</p> <p>Broad concerns have been raised over the possibility of environmental contamination through the uncontrolled release of synthetic organisms, the effects of which were understood to be unpredictable and potentially far-reaching.²⁵</p>	<p>Business participation;</p> <p>Though the public accepts that development of the technology will involve private funding, some participants fear researchers "getting into bed with business" and innovations being taken in directions less beneficial for society.²⁶</p> <p>There was concern over the degree of perceived autonomy allowed to industry and in some cases participants saw industry as leading the way rather than Government.²⁷</p>	<p>Research focused on clearly articulated societal needs;</p> <p>The motivation of scientists in this sector has been questioned²⁸. Given the sense that the public consider themselves powerless to influence the sciences more generally, scientists have a responsibility to consider the wider implications of their work.</p> <p>The public want the opportunity to feed in their aspirations and concerns at an early stage and for Research Councils to make the science accessible.²⁹</p> <p>81% of those surveyed in the UK³⁰ say that the government is responsible for making sure everyone benefits for technological advancements.</p>

²³ Synthetic Biology Sciencewise public dialogue, 2010

²⁴ [Public views on synthetic biology, Sciencewise social intelligence 2013](#)

²⁵ [Public views on synthetic biology, Sciencewise social intelligence 2013](#)

²⁶ Synthetic Biology Sciencewise public dialogue, 2010

²⁷ Public perception of Industrial Biotechnology, Sciencewise public dialogue 2009

²⁸ [Public views on synthetic biology, Sciencewise social intelligence 2013](#)

²⁹ Synthetic Biology Sciencewise public dialogue, 2010

³⁰ Europeans and biotechnology in 2010, Winds of change? Eurobarometer 2010

<p>Incremental solutions</p> <p>The public is apprehensive at the lack of clear 'boundaries' around what is acceptable for the potential applications of synthetic biology.³¹</p>	<p>'Naturalness'</p> <p>Synthetic biology could lead to the transgression of nature; it can interfere with nature and the natural balance.³²</p>	<p>Anticipatory regulation</p> <p>The public supports robust regulation which also allows for legitimate innovation and progress. For the public, the need for effective regulation and control is one of the most important issues – they do not believe scientists should self-regulate.³³</p> <p>Misuse of this technology is a potential concern eg bioterrorism.³⁴</p>
<p>Value for money no finding clearly fits</p>		

3.3.3 Agri-engineering (mainly Robotics & Autonomous Systems - RAS)

As a note of advice, the information about this topic is scarce and the information provided on the table below is limited and many times not specific to agri-engineering, although it provides a few pointers. The research focused on the past 7 years (2008-2014) and the sources are three surveys, a public dialogue, a social intelligence report (2007-2013) and an informal discussion about agri-science (see appendix).

Machines to make decisions and carry out tasks was identified as a priority for both the UK government and for public involvement³⁵ but only 5% of people surveyed had heard about the use of robots in agriculture, with 67% having heard anything at all³⁶.

<p>Conditional support.</p> <p>Generally, the public could see the benefits of “machines to make decisions and carry out tasks” in some areas but were very concerned about it in others.³⁷ There was widespread support for robot use in roles that were difficult or dangerous to do and considerably less support in caring roles³⁸.</p> <p>Public opinion towards RAS tends to be broadly optimistic, stating that these technologies are good for society and could solve problems but there are many issues associated with them, such as requiring careful management or having the potential to impact on employment.³⁹</p>
<p><i>Hopes</i></p> <p>In Public Attitudes to Science 2014, 66% of people surveyed supported the use of robots in agriculture (opposition 13%) and monitoring the condition of food crops and applying water or pesticide as needed was the most supported application of robots.</p> <p>Research focused on clearly articulated societal needs;</p> <p>There was <i>optimism</i> that new and emerging agricultural technologies could help increase the amount of land that it is possible to farm – for instance through salt resistant crops or satellite-guided soil diagnosis – as well as increasing the yield that our existing land can provide⁴⁰.</p>

³¹ Synthetic Biology Sciencewise public dialogue, 2010

³² [Public views on synthetic biology, Sciencewise social intelligence 2013](#), Synthetic Biology Sciencewise public dialogue, 2010; Public perception of Industrial Biotechnology, Sciencewise public dialogue 2009

³³ Synthetic Biology Sciencewise public dialogue, 2010

³⁴ [Public views on synthetic biology, Sciencewise social intelligence 2013](#)

³⁵ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#), Sciencewise dialogue, 2013

³⁶ Public attitudes to science 2014

³⁷ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#), Sciencewise dialogue, 2013

³⁸ Public attitudes to science 2014

³⁹ Robotics and autonomous systems: what the public thinks, Sciencewise social intelligence 2013, [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#), Sciencewise dialogue, 2013

⁴⁰ Cheltenham agri-tech discussion report, 'Farming for the future?', 2013

Concerns		
<p>Equitable distribution of both potential benefits and potential risks.</p> <p>Tension between fully exploiting RAS for the benefit of a growing economy (by boosting advanced manufacturing techniques) and the potential loss of jobs as certain labourers are replaced by robots.⁴¹</p>	<p>'Naturalness' .</p> <p>Fear a decrease in human contact and of seeing mankind "robotised", or of robots replacing mankind.⁴²</p>	<p>Anticipatory regulation</p> <p>The public should have a voice in policies about how to regulate the use of machines and that would have a strong ethical component⁴³.</p>
<p>Business participation; Incremental solutions; Value for money no data found.</p>		

3.3.4 Clean technology and energy generation from waste (mainly biofuels)

The research focused on the past 6 years (2008-2013) and the resources are two public dialogues, two surveys and one qualitative study (see appendix).

Europeans are increasingly concerned about energy and sustainability.⁴⁴

<p>Conditional support.</p> <p>For some, bioenergy is only seen as an environmentally constructive technology if it is "managed well" or "produced locally".⁴⁵</p>
<p>Hopes</p> <p>Research focused on clearly articulated societal needs;</p> <p>Participants in the Bioenergy dialogue⁴⁶ could see the potential (not guaranteed) of bioenergy to:</p> <ul style="list-style-type: none"> • Increase the amount of renewable sources in our energy supply (key positive outlined was the fact that bioenergy is renewable) • Offer an alternative to fossil fuels and/or nuclear power • Power our transport needs • Increase energy security through domestic and decentralised generation • Reduce carbon emissions and help tackle climate change and environmental destruction • Generate energy from currently unused resources (land and waste). <p>Incremental solutions</p> <p>Bioenergy is also thought⁴⁷ to match well with our current energy infrastructure and technologies and require minimal alteration of existing fuel burning and consumption systems.</p> <p>Value for money</p> <ul style="list-style-type: none"> • Bioenergy provides cost effective fuel that uses current resources well⁴⁸.

⁴¹ Robotics and autonomous systems: what the public thinks, Sciencewise social intelligence 2013

⁴² [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#), Sciencewise dialogue, 2013; Qualitative study on the image of science and the research policy of the European Union, 2008

⁴³ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#), Sciencewise dialogue, 2013

⁴⁴ Europeans and Biotechnology in 2010 Winds of Change?

⁴⁵ Bioenergy, Sciencewise public dialogue 2013

⁴⁶ Bioenergy, Sciencewise public dialogue 2013

⁴⁷ Bioenergy, Sciencewise public dialogue 2013

⁴⁸ Bioenergy, Sciencewise public dialogue 2013

Concerns		
<p>Equitable distribution of both potential benefits and potential risks.</p> <p>Displacement of agricultural land by the feedstocks needed to produce first generation biofuels. This was seen to have the potential to impact negatively on human populations in developing countries by taking over land that would have otherwise been used to produce food.⁴⁹</p> <p>Participants with existing knowledge on the subject of bio-fuels were very aware of the potential problems surrounding bio-fuels and the potential for further deforestation to allow bio-fuel feedstock cultivation⁵⁰.</p>	<p>Research focused on clearly articulated societal needs;</p> <p>Researchers should consider humanity generally, taking into account social equity, and the health, cultural and social effects⁵¹.</p> <p>There is higher support for non-food biofuel.⁵² Some suggested that the food/fuel conflict meant that we should stop using first generation bioenergy altogether, with the focus on bioenergy from waste or water-based products⁵³.</p> <p>Speed of progress - the worry is that the UK was being “left behind”, which could lead to negative consequences for the UK economy⁵⁴.</p>	<p>Business participation;</p> <p>Research focused on clearly articulated societal needs;</p> <p>Anticipatory regulation</p> <p>There was a suspicion of private companies gaining monopolies and too much power over energy supply, and calls for strong legislation of bioenergy use and production. Some were concerned that the broader interests of society would be lost in the rush to profit, and that the underlying demand for energy was part of increasing global inequality.⁵⁵</p>
<p>Incremental solutions</p> <p>Many saw bioenergy as a <i>key part of – but not the entire solution</i> to – our energy needs in the future.⁵⁶</p>	<p>‘Naturalness’</p> <p>Some thought that the bioenergy debate could obscure the wider demand-side debate about how to reduce our energy usage.⁵⁷</p> <p>Concerns about impacts closer to home, in relation to the impact of biorefineries on the appearance of the physical landscape.⁵⁸</p>	<p>Value for money</p> <p>Worry about any costs associated with adapting their current products. For example, needing to convert their cars to take biofuels or to buy new cars that can run on biofuels.⁵⁹</p> <p>A large percentage of people responded that that they would pay an additional £5 to £20 on each month’s electric bill for renewable energy, to address global warming, willingness to pay dropped off quickly above £20⁶⁰.</p> <p>Most wanted replacements to be at least as good as what is currently available – biofuel performance at least similar to ordinary fuels⁶¹.</p>

⁴⁹ Public perceptions of Industrial Biotechnology, Sciencewise public dialogue 2009

⁵⁰ Public perceptions of Industrial Biotechnology, Sciencewise public dialogue 2009

⁵¹ Bioenergy, Sciencewise public dialogue 2013

⁵² Europeans and Biotechnology in 2010, Winds of Change? Eurobarometer for EC

⁵³ Bioenergy, Sciencewise public dialogue 2013

⁵⁴ Bioenergy, Sciencewise public dialogue 2013

⁵⁵ Bioenergy, Sciencewise public dialogue 2013

⁵⁶ Bioenergy, Sciencewise public dialogue 2013

⁵⁷ Bioenergy, Sciencewise public dialogue 2013

⁵⁸ Public perceptions of Industrial Biotechnology, Sciencewise public dialogue 2009

⁵⁹ Public perceptions of Industrial Biotechnology, Sciencewise public dialogue 2009

⁶⁰ A Survey of Public Attitudes towards Energy & Environment in Great Britain, MIT opinion survey 2005

⁶¹ Public perceptions of Industrial Biotechnology, Sciencewise public dialogue 2009

3.3.5 Environmental sciences

The research focused on the past 6 years (2008-2013) the resources are three surveys, two public dialogues and one discussion paper (see appendix).

Keep the lights on whilst reducing carbon emissions was identified as a priority for both the UK government and for public involvement⁶².

Conditional support.

The relatively high level of financial support, initially for incentivising production and in more recent years to improve environmental sustainability, still has a high level of public acceptance.

However this financial support should be for looking after the land in an environmentally-friendly way but not for production purposes or during a crisis (26% strongly agree, 33% partly agree). This financial support from the public purse comes with some understanding that some societal return is expected⁶³.

Hopes

Research focused on **clearly articulated societal needs**;

The UK public interviewed⁶⁴ generally saw environmental sciences as highly practical because these were addressing important problems affecting people's daily lives). Between 2000 and 2008, environmental issues received one of the largest increases in interest by the UK public, when compared with other science topics⁶⁵.

⁶² [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#), Sciencewise dialogue, 2013

⁶³ Public attitudes to agriculture, the farmed landscape and natural environment, Agricultural Change and Environment Observatory, 2010

⁶⁴ Public attitudes to Science 2011

⁶⁵ Public attitudes to Science 2008

<i>Concerns</i>		
<p>Equitable distribution of both potential benefits and potential risks.</p> <p>The twin challenges presented by the economic situation and climate change led some participants to raise questions about 'our way of life' generally. Excess or waste were viewed with distaste. Participants⁶⁶ raised concern that the western 'way of life' may be negatively affecting both the people and the environment of the rest of the world.</p> <p>When presented with options between environmental objectives and wider social objectives (such as providing for leisure opportunities and maintaining a way of life) and food production, producing food is significantly more desirable as a primary objective.⁶⁷</p> <p>The complexity surrounding trade-offs e.g. balance between food and social or environmental objectives is not captured easily. Although only 5% of respondents chose (as a first option) to preserve a traditional way of life this does not mean that the public does not regard wider social objectives as unimportant as in an earlier survey 84% agreed with the statement: it is important to support British farming otherwise we would lose a traditional way of life.⁶⁸</p>	<p>Research focused on clearly articulated societal needs; Anticipatory regulation</p> <p>Participants in a dialogue⁶⁹ felt that the public would be more likely to buy into policies addressing this if they had played a role in formulating them. They also thought the public needed to be educated about how their behaviours could contribute to the success of these policies.</p>	<p>Naturalness' On a public dialogue⁷⁰, some felt there needed to be more research to understand when we might reach a tipping point in global warming.</p>
<p>Business participation; Incremental solutions no data found</p> <p>value for money no data found but it's expected to be similar to biofuels/ renewable energy (cost and quality)</p>		

⁶⁶ Public perceptions of Industrial Biotechnology, Sciencewise public dialogue 2009

⁶⁷ Public attitudes to agriculture, the farmed landscape and natural environment, Agricultural Change and Environment Observatory, 2010

⁶⁸ Public attitudes to agriculture, the farmed landscape and natural environment, 2010

⁶⁹ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#) Sciencewise public dialogue 2013

⁷⁰ [Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK](#) Sciencewise public dialogue 2013

3.3.6 Health of crops and livestock

The research focused on the past 7 years (2007-2013) with one survey and one study with focus groups from 2007, two 2010 papers and the most recent information coming from public comments to 2013 media reporting and the Sciencewise [Citizen Dialogue on Bovine TB](#), commissioned in 2013 (see Appendix). The information collected is mainly about livestock.

In 2007 UK was in the group of countries with **information saturation** about animal welfare: existing knowledge was higher than average, but respondents were less receptive to being given further information⁷¹. Information on the impact of farming systems on animal welfare seems to be mainly gained from the media and it had an effect on the consumers purchasing habits⁷².

A 2001 European report⁷³ revealed high levels of concern about animal welfare. However, it also revealed that *changes in consumption patterns*, especially from red meat to white meat, were almost wholly motivated by anthropocentric concerns, such as human health, food safety, and changes in lifestyle. In the UK, between 2007 and 2010 animal welfare rating as a highly important ethical consideration increased from 48 to 59%⁷⁴.

Conditional support.

There is tentative acceptance of lab-grown meat but asking for thorough testing⁷⁵.

Animal welfare is seen as a matter of importance⁷⁶ but when shopping for meat the general concern was mainly with nutritional issues and other health and safety issues (particularly BSE), followed by appearance⁷⁷.

Hopes

Business participation in research

Increased partnership working to contribute to a more successful strategy for achieving official bovine tuberculosis-free status for England⁷⁸.

Research focused on **clearly articulated societal needs**;

There is openness and agreement to ethical benefits of lab-grown meat.⁷⁹

The importance of working towards Officially Bovine TB (bTB) Free Status for England is acknowledged⁸⁰.

Incremental solutions

Frequent cattle testing as a way to stem the spread of bTB by detecting infection as early as possible and support for increased frequency of testing in the low risk area and enhanced slaughterhouse surveillance.⁸¹

Positive opinions about animal welfare are largely linked to knowledge⁸².

⁷¹ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

⁷² Attitudes of EU citizens towards animal welfare, Eurobarometer 2007 & Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

⁷³ Consumer Concerns about Animal Welfare and the Impact on Food Choice 2001

⁷⁴ The proportion of people interested in improving animal welfare 2005-2009, RSPCA 2010

⁷⁵ Brave moo world, Sun 6/8/2013 (comments)

⁷⁶ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007 & Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

⁷⁷ Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

⁷⁸ Defra bovine TB citizen dialogue, cross-cutting summary, Sciencewise 2014

⁷⁹ Why I've a healthy appetite for stem-cell meat, Telegraph, 5/8/13. (comments)

⁸⁰ Defra bovine TB citizen dialogue, cross-cutting summary, Sciencewise 2014

⁸¹ Defra bovine TB citizen dialogue, cross-cutting summary, Sciencewise 2014

⁸² Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

Concerns

Although most believe that animal welfare has improved, when asked about welfare protection in the future, the vast majority of Europeans believe that there is a **need for further improvements** to be made in their country⁸³.

The majority of citizens wish to be **better informed** about the conditions under which animals are farmed. There is a link between respondents' degree of education and their knowledge of welfare conditions, with those continuing education to the age of 20 and beyond the most likely (76%) to claim at least some knowledge and those ending their studies at 15 the least likely (65%)⁸⁴.

Most consumers say it is hard to find information on product sourcing (labelling is seen as the best mean of identifying product sourcing).⁸⁵

Equitable distribution of both potential benefits and potential risks. & Research focused on **clearly articulated societal needs**;

A call for enhanced surveillance of badgers to understand transmission better and frustration about the length of time before a licensed cattle TB vaccination will be available for use⁸⁶. The need for effective public communication of accurate information about bTB and its controls.

lab-grown meat (media):

- questioning the premise of wanting low meat prices; concern over higher levels of cruelty associated with industrial farms.⁸⁷

- taking issue with pouring money into "faux science hype burger"⁸⁸

Business participation

On a series of focus groups, supermarkets were universally distrusted⁸⁹.

There was agreement that farmers should **share the cost** with the Government for preventing animal disease outbreaks (22% strongly agree and 33% partly agree)⁹⁰. In 2007 Eurobarometer⁹¹ found that farmers were seen as the main stakeholder responsible for animal-friendly production. Another study showed consumers generally thought that the Government should take responsibility for the issue of animal welfare, and that it should not be left to the consumer⁹².

There are requests for more clarity about where responsibilities lie for managing bovine tuberculosis⁹³.

(media comments):

- questioning affiliations of experts and whether industry voices can be trusted (large scale farms and free-range vs factory farmed chickens)⁹⁴

- suspicion that technological advances will not be used to feed the hungry but rather to

'Naturalness'

When consumers lack information, they support⁹⁷:

- The farm-to-fork chain of **free-range/organic products**: allows for connotations of benevolent suppliers, high levels of animal health and welfare, environmental sustainability, and food safety and quality. This is illustrated by comments to media reporting: questioning the ethics and health/environmental impacts of larger farms; incredulity and anger at study that finds welfare standards for free range hens can be worse than caged and commitment to buying free range and organic, wide support for the ban neonicotinoid pesticides; scepticism that lab meat will ever come close to simulating conventional meat; fears about possible health impacts from 'unreal food'.

- **British or local food**: implicates good traceability, trustworthy food supply chain actors, (nationally or locally based) social equity, and high levels of food safety and quality, animal health and welfare, and environmental sustainability

⁸³ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

⁸⁴ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

⁸⁵ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

⁸⁶ Defra bovine TB citizen dialogue, cross-cutting summary, Sciencewise 2014

⁸⁷ UK needs 'mega farms' to keep food prices down, say experts, Guardian, 12/11/13 (comments)

⁸⁸ Why I've a healthy appetite for stem-cell meat, Telegraph, 5/8/13. (comments)

⁸⁹ Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

⁹⁰ Public attitudes to agriculture, the farmed landscape and natural environment, Agricultural Change and Environment Observatory 2010

⁹¹ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

⁹² Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

⁹³ Defra bovine TB citizen dialogue, cross-cutting summary, Sciencewise 2014

⁹⁴ UK needs 'mega farms' to keep food prices down, say experts, Guardian, 12/11/13 (comments)

	<p>profit the developers (lab grown meat)⁹⁵ - suggesting the UK government is too close to industry (neonicotinoid pesticides)⁹⁶</p>	<p>Consumers are most likely to buy animal-friendly produce because it is seen as healthier and high quality⁹⁸.</p> <p>There was a range of views about the efficacy and appropriateness of culling as part of the bTB Strategy⁹⁹.</p>
<p>Incremental solutions</p> <p>No data but the reactions to lab grown meat (2,4 &6 in this table) can be also considered here.</p>	<p>Value for money</p> <p>The biggest barrier to non-purchase of welfare-friendly products was price, although trust and lack of time to look at labels were also high on the list. Other barriers were lack of information, and also the disassociation of production from animal welfare, where consumers were not thinking about the fact that meat comes from farm animals and the resulting welfare issues of animals when purchasing meat¹⁰⁰. Free range –eggs were the only commonly purchased welfare-friendly product¹⁰¹.</p> <p>There was a consensus that, as people find it hard to choose welfare-friendly goods when they are on a budget, they would in fact rather not have the choice and thus be forced to 'do the right thing'¹⁰².</p> <p>Consumers altered their consumption patterns following the avian influenza outbreak³, for most temporarily but some with a permanent effect (reduced or stopped buying poultry or bought only British poultry meat)</p>	<p>Anticipatory regulation</p> <p>Large majorities felt that linking payments with certain rules for environmental, animal welfare and food safety were either “totally” or “somewhat justified”. 42% thought that environmental cross-compliance was “totally justified”, 52% for animal welfare standards and 61% for food safety¹⁰³.</p> <p>There is support to encourage farmers to adopt on-farm biosecurity measures to reduce risk of bTB infection, though views differed across strands on what this system should be¹⁰⁴. On the other hand, previous surveys showed strong endorsement of the idea that farmers should be financially compensated for any higher production costs linked to farming animals under more welfare-friendly conditions¹⁰⁵.</p>

⁹⁷ Food risks and consumer trust. Avian influenza and the knowing and non-knowing on UK shopping floors Appetite 55 (2010) 671–678

⁹⁵ Brave moo world, Sun 6/8/2013 (comments)

⁹⁶ Ban pesticides linked to bee deaths, say MPs, BBC News Online 5/4/13 (comments)

⁹⁸ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

⁹⁹ Defra bovine TB citizen dialogue, cross-cutting summary, Sciencewise 2014

¹⁰⁰ Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

¹⁰¹ Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

¹⁰² Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

¹⁰³ Public attitudes to agriculture, the farmed landscape and natural environment, Agricultural Change and Environment Observatory 2010

¹⁰⁴ Defra bovine TB citizen dialogue, cross-cutting summary, Sciencewise 2014

¹⁰⁵ Attitudes of EU citizens towards animal welfare, Eurobarometer 2007

3.3.7 Nutrition and human nutrition, functional foods and nutraceuticals

The information found is limited to 3 academic papers (2 reviews) (2008-2011), as described in the Appendix. Public Attitudes to Science 2008 reported that conflicting information was a recurring theme in the group discussions and led some people to disengage with science, especially those aspects of science that impact on their daily lives such as health and nutrition advice.

In the same year it was reported that in the UK, France and Germany, the most important countries within the functional food market in Europe, up to 75% of the consumers had not heard about the term “functional food”, but more than 50% agreed it was useful to fortify functional ingredients in specific food products.¹⁰⁶

<p><i>Hopes</i></p> <p>Research focused on clearly articulated societal needs;</p> <ul style="list-style-type: none"> - 66.6% of European respondents reported that they would be willing to undergo genetic testing and 27% to follow a personalised diet. Individuals who answered positively were more likely to report a history of health problems.¹⁰⁷ - There is a positive view that molecular farming has the potential to be a useful development in medical response to diseases.¹⁰⁸ 		
<p><i>Concerns</i></p>		
<p>Equitable distribution of both potential benefits and potential risks.</p> <p>Plant-made pharmaceuticals must be thoroughly tested before introduction¹⁰⁹.</p>	<p>‘Naturalness’</p> <p>Containment is crucial for the introduction of plant-made pharmaceuticals, preferably in greenhouses¹¹⁰.</p>	<p>Anticipatory regulation</p> <p>Specific regulation addressing molecular farming is necessary. The preference of growing location for pharmaceutical crops is influenced by the perceived strength of regulation¹¹¹.</p>
<p>Conditional support, Business participation; Incremental solutions; Value for money</p> <p>No data found</p>		

3.3.8 Food science, food and farming supply chain

The research includes 5 surveys, one informal discussion, one public dialogue and 4 media reporting comments (2008-2014) – see Appendix.

People see food security as an important issue both globally and nationally, they tend not to see it as scientific issue, but rather a political or economic issue. Whilst people see global food security as an important issue currently, they see national food security as becoming more important in the longer term¹¹². Participant in a dialogue about global food security¹¹³ focused on domestic, rather than global food issues, suggesting a need to relate global consequences on local choices.

¹⁰⁶ Functional food. Product development, marketing and consumer acceptance—A review, *Appetite* 51 (2008) 456–467

¹⁰⁷ Consumers and new food technologies Trends in Food Science & Technology 22 (2011) 99-111

¹⁰⁸ [Public Attitudes Toward Molecular Farming in the UK \(2009\)](#)

¹⁰⁹ [Public Attitudes Toward Molecular Farming in the UK \(2009\)](#)

¹¹⁰ [Public Attitudes Toward Molecular Farming in the UK \(2009\)](#)

¹¹¹ [Public Attitudes Toward Molecular Farming in the UK \(2009\)](#)

¹¹² Public Attitudes to Science 2014, Ipsos Mori

¹¹³ Global Food Security Programme – Exploring public views, TNS, 2012

People participating in a dialogue activity were oblivious to issues around food security and sustainability, but became very engaged once they were explained and felt that others need to be better informed. Clearer advice as well as in-store information and labelling, was wanted by many participants (Which? 2013).

Conditional support.

Hopes

A large majority of people think that all agricultural technologies should be considered to help secure world food production, but this confidence wanes when discussing GM crops specifically¹¹⁴.

The highest farmer roles and responsibilities accorded respectively to **producing quality food and provide food that meets the needs of British shopper**.¹¹⁵

Concerns

- Consumer interests are not being given enough priority by decision-makers. There is a lack of consumer focus in the way that policy is developed, the way that responsibilities are split across government and a more general failure to listen and respond to consumer views about the different issues that need to be addressed. Government strategy should be built on deliberative research methods and a broader based public engagement initiative around the future of food¹¹⁶.

After the horse meat scandal 73% now feel less confident in the safety of processed meat¹¹⁷. 49% of those surveyed will now buy less red meat, processed meat and/or ready meals. 67% of those intending to buy less say it's due to lack of trust. Knowledge and concern is driven by older people and females. Women and older people more likely to change future purchase behaviour, with reduced purchasing of red/processed meat and value options¹¹⁸.

- Food products are an especially sensitive area for European consumers, and concerns are already widespread amongst them as regards the "black box" that constitutes the food chain– even setting aside the question of GMOs¹¹⁹.

¹¹⁴ Public Attitudes to Science 2014, Ipsos Mori

¹¹⁵ Public attitudes to agriculture, the farmed landscape and natural environment, 2010

¹¹⁶ The Future of Food , Which? 2013

¹¹⁷ FSA – consumer attitudes to towards the horse meat contamination issue, 2013

¹¹⁸ FSA – consumer attitudes to towards the horse meat contamination issue, 2013

¹¹⁹ Qualitative Study on the Image of Science and the Research Policy of the European Union, Eurobarometer 2008

<p>Equitable distribution of both potential benefits and potential risks.</p> <p>While experts tended to focus on yields and increasing production of food, the public challenged that¹²⁰:</p> <ul style="list-style-type: none"> - Should our focus in fact be on reducing waste and rebalancing existing inequalities in distribution? - Should there be more focus on quality over quantity? <p>Consumers tended to blame government for stimulating imports rather than local farmers, and cheap instead of high-quality food. Government is to provide more support to local, and free-range organic farmers by means of marketing assistance, advice, standardising labels, and limiting supermarket power over suppliers¹²¹.</p>	<p>Business participation</p> <p>People saw a role for government in helping maintain trust in the system of food production, this included holding business to account for their practices. Blame for the horse meat contamination issue is considered to lie with the food manufacturers and before the agri-food industry was most often considered to bear most of the blame for the mad cow affair¹²²</p> <p>Interviewed consumers¹²³ argued that the supermarket and its suppliers are to a large degree responsible for assuring that food meets consumers' requirements. These actors should provide accurate information on the origin of products.</p> <p>Some expressed that many outcomes have been pre-determined by political and economic interests. Control of the farming/food system needs to be spread such that no one actor has too much power¹²⁴. This idea is backed up by participants in focus groups that came up with the idea that any standard should be under the administration of a group representing all the separate actors throughout the food chain, so that no one group would dominate¹²⁵.</p>	<p>'Naturalness'</p> <p>Products should preferably be nationally or locally sourced, so that UK and local economies are supported, and food safety can be assured through well-functioning traceability mechanisms. Farmer's market vendors' products are particularly appreciated, one of the reasons being their shorter supply chains than supermarkets (as long supply chains equal a lack of knowledge of foodstuff's provenance and forestall supporting local producers).¹²⁶</p> <p>There were some concerns on "artificial" agro-food production methods not linked to genetic modification¹²⁷.</p>
<p>Incremental solutions</p> <p>The future was not about one particular approach or system of farming. Organic may have a role, but won't be enough and advantage needs to be taken of science and</p>	<p>Value for money</p> <p>The price of food was (initially) the dominant concern for most people participating in a dialogic activity, although they were generally unaware of the issues underpinning food price</p>	<p>Research focused on clearly articulated societal needs;</p> <p>There needs to be a much more transparent and open exploration of the role of new technologies compared to other options for UK food</p>

¹²⁰ Cheltenham agri-tech discussion report, 'Farming for the future?', 2013

¹²¹ Food risks and consumer trust. Avian influenza and the knowing and non-knowing on UK shopping floors Appetite 55 (2010) 671–678

¹²² Eurobarometer 55.2: Europeans, Science and Technology, 2001

¹²³ Food risks and consumer trust. Avian influenza and the knowing and non-knowing on UK shopping floor, Appetite 55 (2010) 671–678

¹²⁴ Cheltenham agri-tech discussion report, 'Farming for the future?', 2013

¹²⁵ Consumers' views about farm animal welfare – 3. United Kingdom, Welfare Quality reports n4 (EU FP6 project), 2007

¹²⁶ Food risks and consumer trust. Avian influenza and the knowing and non-knowing on UK shopping floors, Appetite 55 (2010) 671–678

¹²⁷ Qualitative Study on the Image of Science and the Research Policy of the European Union, Eurobarometer 2008

<p>technology. Participants on the dialogue thought a clearer strategy for what can be grown most efficiently in different regions was needed¹²⁸.</p> <p>View that an innovation-led approach to tackle global food security was not sustainable¹²⁹.</p>	<p>volatility¹³⁰.</p> <p>Quality, price and origin are considered important in most Member States with price being especially important for those citizens who have difficulties paying bills. In the UK, 52% think origin of food is important (45% don't mind) and for 66% quality of food is very important. 63% check quality labels at least sometimes, 24% always.¹³¹</p>	<p>production going forward. This includes addressing research needs and ensuring consumer choice¹³².</p> <p>People warned against false promises – new technologies proposed need to be realistic and offer real benefits for UK consumers¹³³. Different technologies should not be a choice against another, and that biotechnologies should not dominate over technical on agenda¹³⁴.</p> <p>Many think that the government is not doing enough to ensure food security in the future¹³⁵.</p>
<p>Anticipatory regulation</p> <ul style="list-style-type: none"> - People expected effective, independent regulation of new technologies¹³⁶. - There needs to be an appropriate balance between cumbersome regulation and effectiveness. Effective, targeted controls across the supply chain benefit consumers and the food industry. They must be effectively implemented and enforced so that there are much stronger deterrents for failure to comply with legislation and deliberate fraud¹³⁷. - some consumers held government responsible for assuring food quality, by regularly controlling whether vendors abide to health and safety regulations¹³⁸. 		

¹²⁸ The Future of Food , Which? 2013

¹²⁹ Global Food Security Programme – Exploring public views, TNS, 2012

¹³⁰ The Future of Food , Which? 2013

¹³¹ Europeans' Attitudes towards Food Security, Food Quality and the Countryside, 2012

¹³² The Future of Food , Which? 2013

¹³³ The Future of Food , Which? 2013

¹³⁴ Global Food Security Programme – Exploring public views, TNS, 2012

¹³⁵ Public Attitude to Science 2014, Ipsos Mori

¹³⁶ The Future of Food , Which? 2013

¹³⁷ The Future of Food , Which? 2013

¹³⁸ Food risks and consumer trust. Avian influenza and the knowing and non-knowing on UK shopping floors Appetite 55 (2010) 671–678

4 Analysis of views

Generally there is conditional support for new technologies and the food and farming supply chain, especially if they are framed as addressing specific **societal needs** such as feeding a growing population. Although there are specific views for each area, recurrent concerns raised by the public are:

- For all topics the public referred to the need to have adequate **anticipatory regulation and monitoring** in place. The government is seen as the key actor in ensuring robust regulation. The regulation and policies should be developed involving the public and listening to their concerns, consider ethical, environmental and health issues, be independent (namely from business interests). The need to have some degree of flexibility and a balance between regulation and effectiveness is acknowledged.
- Concerns about “**unnaturalness**”. Related with this is the uncertainty of long term health and environmental consequences, some feeling uncomfortable on interfering with nature (GM, synthetic biology), the fear of decrease of human contact (robotics) and of landscape changes (biofuels) and the perception that local/national and free range/ organic products have better quality, are better for the environment and for animal welfare and promote social equity (health of crops and livestock, food science, food and farming supply chain)
- The **lack of confidence in industry** to care for wider societal needs raises concerns when business is perceived to be leading the way, to be too close to government or having the potential to gain monopolies. In some cases there is no information about business participation, perhaps due to scarce information about public views on the topic (agri-engineering, environmental sciences, nutrition related research).

Common to all is also the wish to understand the societal impact of research and the trade-offs between risks and benefits. Often the government is seen as having a role ensuring research is catering for societal needs, which relates to the regulation and monitoring mentioned above.

5 Gap analysis

Agri-technologies can be easily related with people's daily lives and it does raise public interest.

Even so there are areas such as functional food and nutraceuticals, agri-engineering and environmental sciences where there is limited information about public views. For other topics such as synthetic biology where there has been engagement, the public are not sufficiently informed for them to be able to weight risks and benefits, even if the public want to be involved.

Noticeably there isn't a consistent approach that explores public views on different possible solutions for the same societal problem:

All agri-technologies address the challenge to feed the 9 billion world population, expected by 2050. When explored individually there is often a call to know about alternative options and weight benefits and risks.

Polls and surveys are not able to capture nuanced public views and supported trade-offs. Approaches such as deliberative dialogues or perhaps focus groups would be more suitable and, based on the analysis of views, should consider:

- a clear framing of the societal need
- information about specific technologies; how they can contribute to the societal need, what is different or better about them when compared with other technologies in development and with existing and incremental approaches such as behavioural change and waste and distribution management; what are their potential risks and benefits (including health, environmental, economic and quality impacts).
- Discussion of industry role, opportunities for the public to get involved, regulation and monitoring in place or planned. There is a Sciencewise dialogue currently underway that is designed to provide further insights on how the relationship between a publicly-funded research centre and commercial companies should be considered. The "naturalness" perception should be discussed when appropriate.

The trust in the supply chain in terms of quality, animal welfare, environmental and social impacts are likely to be ingrained in these discussions as local products and farmer markets seem to be more trusted than processed products and supermarkets.

(...) stakeholders and policy-makers should adopt a proactive approach towards consumers, combining appropriate stakeholder forums aimed at tackling the issues head-on by informing, and public consultation at the early stage of development. Keeping in mind that extensive worldwide debate over GM foods and related issues hasn't resulted in consensus over GMOs yet, the increase in public acceptance in new technologies may be a long-term process. When it comes to advertising and marketing to consumers about new technologies, campaigns that incorporate improved, convenience, naturalness, taste and benefit for the consumer could have a positive impact on consumers food choice, particularly when the message is concise and from trusted sources.

Consumers and new food technologies Trends in Food Science & Technology 22 (2011) 99-111

6 Appendix: summary of sources of information

6.1 Crop and livestock genomics; genetics; plant breeding (GM food)

Title	Type*	Produced/delivered by	date	Outline
Skinny genes – how GM food may help you stave off obesity	Media Reporting	Guardian	13/04/13	<ul style="list-style-type: none"> •GM is being used to develop foods which tackle health problems •Guardian daily print readership ~900 000, daily online readership ~1 200 000 •126 online comments including: cynicism that good news GM stories are PR for Monsanto and confusion about what to believe; support for publicly funded GM research; lack of faith in any positive claims about GM and the benefits of organic; relief that the GM debate has moved on from corporations vs. activists; the need for people to exercise more instead.
Cheltenham agri-tech discussion report 'Farming for the future?'	Informal public discussion on agri-tech policy	BBSRC & Sciencewise at Cheltenham Science Festival	June 2013	<p>Farming for the future?' was hosted by the Science Minister, David Willetts, and managed by experts from the Biotechnology and Biological Sciences Research Council, supported by Sciencewise facilitators.</p> <p>The report is an interpretation of the discussions based on the written flip chart records and the input of the facilitation team at the event.</p> <p>There were a relatively large number of participants who identified themselves as farmers.</p> <p>Public views: Questions were raised about how the UK can remain competitive and what might the merits or otherwise be of adopting GM. (<i>societal needs</i>)</p> <p>It was suggested that although consumers want cheap food, the UK could focus on producing a premium product for which people will pay more. It was suggested that GM-free was valued by consumers and so added a premium to products. (<i>value for money</i>)</p>
Public engagement activities	survey	Norwich BioScience Institutes	2012-2013	<p>Anecdotal unpublished data provided by Dee Rawsthorne, collected in:</p> <ul style="list-style-type: none"> - Big Bang Fair 2013, London - Cheltenham Science Festival, 2013 - Science in Norwich Day, 2013

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				<p>- Jimmys Farm Science Day, 2012</p> <p>About 800 members of the public were asked “Should UK farmers be allowed to try GM crops?”</p> <p>98% answered yes.</p>
<p>Talking about GM: Approaches to Public and Stakeholder Engagement</p>	<p>Review of public dialogues about genetically modified crops and food</p>	<p>Sciencewise-ERC subgroup on GM dialogue</p>	<p>2011</p>	<p>A review of key findings from public dialogue/engagement exercises about genetically modified crops and food between 1994-2011.</p> <p>Public views:</p> <p>There is no evidence of overwhelming intrinsic opposition to GM. Public concerns are conditional.</p> <p><i>Concerns</i></p> <ul style="list-style-type: none"> - Concerns range from those that are specific to GM technologies to those that are about the governance of science and innovation in general - The perceived “unnaturalness” of GM technologies is a key concern as is the potential hazards of GM food <p>The 'need' for GM was questioned and was seen as not having been demonstrated, especially given the potential risks and the availability of other options to solve specific problems.</p> <p>The risks to the environment and biodiversity from GM crops were very widespread concerns, even among those who had fewer worries about the 'food safety' aspects of GM.</p> <p><i>Regulation</i></p> <p>At the broadest level, people lack confidence in the ability of scientists, companies and governments to understand and regulate the myriad possible implications of new science and technology.</p> <p>Government, rather than the private sector, was seen as appropriate to lead development and ensure robust regulation of these technologies although there was some distrust of government and multi-national companies, especially around willingness to listen to public worries.</p>

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<p>Consumers and new food technologies Trends in Food Science & Technology 22 (2011) 99-111</p>	<p>Academic review</p>	<p>Fanny Rollin, Jean Kennedy and Josephine Wills European Food Information Council (EUFIC)</p>	<p>2011</p>	<p>Literature review. Aim: To describe the current landscape in Europe within which emerging food technologies are developed and applied, and to give insights from other parts of the world. Consumers' attitudes towards emerging food technologies are described, with a focus on five case-studies; nanotechnology, genetic modification, nutrigenomics, food irradiation and animal cloning. Public views: A majority of UK consumers (74.5%) seems to be willing to purchase GM foods if they are cheaper than traditional foods.</p>
<p>Public Attitudes to Science 2011</p>	<p>Ipsos Mori 2011</p>	<p>Ipsos Mori Social Research Institute</p>	<p>2011</p>	<p>A mixed methodology approach was used: review of the existing literature on attitudes to science in the UK and internationally; quantitative survey of the UK public and four sets of deliberative workshops; research with a cluster analysis of the quantitative data, followed by four discussion groups exploring the identified clusters qualitatively. 2,103 interviews conducted with UK adults aged 16+. Of these, 1,798 interviews comprised the main stage survey of adults of all ages, while 305 additional interviews were conducted exclusively with 16-24 year olds as a young people booster survey. Public views: <i>valuing naturalness</i> An area of concern was of science going against nature, which came across in discussions about fertility treatment, <i>GM crops</i>, cloning, <i>food additives</i>, pollution and climate change caused by overusing fossil fuels. These fears are also present in the survey, with over half (56%) agreeing that "people shouldn't tamper with nature", although this is markedly lower than in 2008 (70%). GM crops - The more contentious of the issues explored, where people are more split over the risks and benefits, are GM crops, nuclear power and the use of animals in research. - Black people are more likely than average to think the risks outweigh the benefits of GM crops (43%, versus 27% overall). - feeling informed does not necessarily correlate with a more positive attitude towards these issues. Instead, the people who feel more informed about these more</p>

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				<p>contentious topics tend to be more polarised in their views of the risks and benefits – this group is more likely than average to think the benefits outweigh the risks and more likely than average to think the risks outweigh the benefits.</p> <p>-72 % agrees that “You need a licence before you can plant genetically modified (GM) crops in the UK” (<i>anticipatory regulation</i>)</p> <p>- Late Adopters (cluster of those whose interest in science began after school) have strong reservations about areas of science such as GM crops. Related to this, they want to hear scientists talking more about the <i>social and ethical implications</i> of their work. Late Adopters are also more likely to think the risks outweigh the benefits of GM crops (35%, versus 27% overall).</p>
Europeans and Biotechnology in 2010 Winds of Change?	Eurobarometer for EC (73.1)	panel of experts for European Commission’s Directorate-General for Research	2010	<p>26676 reached in total, 1316 in UK. The survey questionnaire includes key trend questions, designed to assess the stability or change in aspects of public perceptions over the last ten years or more. It also includes questions that capture opinions and attitudes to emerging issues in the field of biotechnology.</p> <p>55.9% of UK public believe that “Biotechnology and genetic engineering will have positive effect on life”</p>
Public perceptions of Industrial Biotechnology	Sciencewise public dialogue	Opinion Leader for the Department for Business Enterprise and Regulatory Reform (BERR)	2009	<p>48 people reached. Citizen’s Jury supported by a Project Advisory Group (PAG), made up of stakeholders.</p> <p>The research was qualitative and exploratory in nature, and sought to understand what ‘excites’ and ‘worries’ people about this emergent technology in a variety of its applications.</p> <p>Public concerns:</p> <ul style="list-style-type: none"> - At first, participants were extremely wary of GM of any kind, in terms of products and its use in industrial processes. - <i>Cross-contamination within the natural environment</i> was biggest concern. - For a minority of those taking part, GM was a moral issue, quite regardless of whether it was ‘safe’ or not. - For most, the principle of changing genes was neither a moral issue nor an enduring concern; it was the <i>potential and unknown effects of it that was key</i>. <p>UK numbers:</p> <ul style="list-style-type: none"> - only 5 % believe that “Animal cloning in food is good for national economy”

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				<ul style="list-style-type: none"> - 18% believe that it is “Not good for you and your family” - It makes 38 % of respondents feel uneasy - Only 3 % believe it is “Safe for you and your family’s health” and 6 % that it “Should be encouraged”. - 45 % believe that decisions on the topic should be based on ethics, not science, whereas 42% think the opposite. - 50% believe that decisions should be based on expert opinion rather than that of the majority, versus 39% who believe the opposite. - 88% agree that the field should be tightly regulated by the government.
<p>Consumer acceptance, valuation of and attitudes towards genetically modified food: Review and implications for food policy. Food Policy 33 (2008) 99–111</p>	Academic Review	Montserrat Costa-Font, Jose´ M. Gil, W. Bruce Traill	2008	<p>Objective: To gather an understanding of the published findings on the determinants of the valuation of GM food – both in terms of willingness to accept and the willing-to-pay a premium for non-GM food, trust with information sources on the safety and public health and ultimate attitudes underpinning such evidence.</p> <p>Public views:</p> <ul style="list-style-type: none"> - For UK consumers GM food, relative to other current concerns such as cancer, terrorism and biological warming among others, was ‘not dreaded’, was thought to be ‘controllable’, was not viewed as ‘unethical’, and was seen as the least ‘risky’ among all other consumer concerns. - Trust in public authorities appeared to be in decline, especially in the UK - US and UK consumers consider government and science as the main actors regarding GM technology control. - European consumers are willing to pay higher premiums for non-GM foods compared North American consumers. - The demand for non-biotech food is greater in the UK than in the USA. - UK consumers may be more willing to accept genetic modification to food products where there were benefits to health and the environment but less likely to accept GM where the main benefits were to increase shelf-life of a product or to reduce the purchase price. - Acceptance of GM technology does not imply a willingness to buy. Although the majority of the UK participants were willing to taste GM food (intention), only half of the sample stated their willingness to buy GM food when it became available. - Perceived risks have a negative impact on consumers’ WTP for GM food - Danish, German and British consumers identified risks as an obstacle for the

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				<p>perceptions of benefits associated with GM food.</p> <ul style="list-style-type: none"> - In most European countries, and specifically in Nordic countries, Britain, and Germany, consumers find benefits associated to GM food as insufficient to overcome their associated (perceived) risk.
<p>Qualitative Study on the Image of Science and the Research Policy of the European Union</p>	<p>Eurobarometer</p>	<p>Optem for European Commission.</p>	<p>2008</p>	<p>220 subjects in total, 8 Brits, 27 group discussions.</p> <p>Objectives:</p> <ul style="list-style-type: none"> • Assessing the various dimensions of perceptions relating to science (and technology) and research, and identifying factors underlying European citizens' perceptions. • Analysing their perceptions and attitudes relating to research issues in various areas that are currently the object of controversy and public debate. • Analysing their degree of information and knowledge about science and research and identifying information sources and channels. • Assessing their attitudes regarding, on the one hand, research activities at the national level and, on the other hand, the research policy at the European level – and expectations for the future in these respects. • Testing a number of elements of DG Research's information and communication, and collecting suggestions as to how one could make scientific questions better understood and more attractive and increase citizens' involvement in related issues. <p>Public views:</p> <p>Reservations mainly involved genetics: manipulations, cloning, eugenics, dangerous seeking of "eternal youth", abusive in vitro fertilisation, "cryogenics" etc.</p> <p><i>Distrust of GMOs is rife, with:</i></p> <ul style="list-style-type: none"> -The general idea of "not being natural", "altering the natural" and of processes "going against nature". -The perceived lack of appeal of products derived from processes assimilated with the stimulation or artificial orientation of production, resulting in products that are visually impeccable but devoid of flavour, leading to a levelling out of qualities and taste. -The risks for food safety that can be caused by such deviations from the natural – risks which may be unproved but which call for the application of the "precautionary principle".

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				<p>-Risks for the environment, generally poorly identified.</p> <p>To sum up, the general impression is that with GMOs we are playing “the apprentice wizard”. (unknown risks/benefits)</p> <p>Distrust of GMOs is strongly and nearly unanimously expressed in the groups in France, Germany, Spain, Luxembourg, Greece, Cyprus, Poland, the Czech Republic, Slovakia, Hungary, Latvia, Bulgaria and Romania; and it is also frequently apparent in groups in the United Kingdom, Belgium, Ireland, Estonia and Lithuania.</p> <p>The presentation of the possible benefits of GMOs only rarely modifies the initial attitudes of the citizens questioned.</p> <p>On the subject of GMOs, the fears expressed go as far as genetic modifications in humans due to their ingestion.</p> <p><i>Distrust in business participation</i></p> <p>More occasionally (but very strongly) the denunciation of lobbying for economic interests that develop GMOs and the practices of the companies concerned. A need for in-depth information on the subject is spontaneously apparent for a large number of citizens – sometimes with the open suspicion that information is “biased” or has been manipulated by economic or political interests. (business participation)</p>
Science policy and society: the British debate over GM agriculture	Expert opinion piece on the legitimacy of GM Nation and the role that public debate should play	George Gaskell	2004	<p>Reflections on GM Nation, a public consultation whose objective it was ‘to promote an innovative, effective and deliberative programme of debate, against the background of the possible commercial production of GM crops in the UK [and] provide meaningful information to Government about the nature and spectrum of the public’s views, particularly at the grass roots level, to inform decision making’.</p> <p>Public views from GM Nation:</p> <p>People were generally uneasy about GM; the more groups engaged in GM issues the harder their attitudes became; there was little support for early commercialisation; there was <i>widespread mistrust</i> of government and multinational companies (business participation); there was a broad desire to <i>know more</i> and for more research to be done, and an appreciation that developing countries have special interests.</p> <p>Gaskell’s views:</p> <p>What sort of society (health, agriculture and food, and the environment) is desirable</p>

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				and how can new technology help to achieve these goals? These are questions about social values; science alone cannot answer them. As such we need to develop appropriate platforms that bring together policy, science and technology, and civil society.
Crops on Trial: A report by the AEBC	Report by independent commission containing recommendations to UK government to improve legislation on the use of GM technology	AEBC: Agriculture and Environment Biotechnology Commission	2001	<p>Seven AEBC members, with a spread of interests and backgrounds reflecting that of the Commission as a whole, held discussions with local people in areas affected by GM trials and took evidence from both national and local organisations and institutions. The whole Commission deliberated at two separate meetings on the group's proposals, held public meetings and took evidence formally in public.</p> <p>Public views:</p> <ul style="list-style-type: none"> - Views and concerns at both ends of the spectrum – and in between – are genuinely and staunchly held. Some see the ability to isolate and transfer DNA as a useful progressive evolution of selective plant breeding. For others, it marks a disturbing watershed in human intervention in nature, for which political and regulatory frameworks are illprepared. (<i>valuing naturalness, anticipatory regulation</i>) - The majority of the public may or may not be opposed to GM technology per se – but it is reasonable to assume that they do wish to be sure of the integrity and comprehensive nature of the decision-making processes governing how these crops may be used. (<i>business participation, anticipatory regulation, conditional support</i>) <p>In 1997-98, the main concerns were focussed on food, but since then the prospect of widespread commercial crop releases has given focus to worries about gene flow, ecological impacts and other uncertainties, and concern about the importance of preserving choices.</p> <p>According to a NOP survey, the proportion of people in Britain who say that they are happy to eat genetically modified foods is increasing. It was reported in April 2001 that “a poll by NOP found that 48% will eat GM food and 44% still refuse. Only 20 % believe that it is significantly less safe. Last year 50 % rejected GM food while 46 % cent ate it”.</p> <p>In any case, <i>people do want to know what they are eating</i>, so there is public support for labelling food with a GM content.</p> <p>A comparison of the results of European surveys in 1991, 1993, 1996 and 1999 shows that while knowledge about GM technology has increased in Europe, optimism about its ability to improve the quality of life has decreased.</p>

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				<p>The results from the 1999 survey in the UK also indicated that the public see governments as aligned with the industry.</p> <p>In relation to the testing of GM crops specifically, in August 1999 a Greenpeace/MORI poll showed that 62% tended to be or were strongly opposed to having a GM trial in their local area, and 59% believed that GM crop testing (though acceptable in laboratories) should be stopped on farmland.</p> <p>At the local level, all of these issues have been added to local concerns about the fact that most agricultural developments, however significant or intrusive in their wider implications, lie outside the conventional (and publicly accessible) framework of planning controls.</p>
<p>Eurobarometer 55.2: Europeans, Science and Technology</p>	<p>Eurobarometer</p>	<p>European Commission Research Directorate-General</p>	<p>2001</p>	<p>A total of 16 029 people were questioned, of which 1 000 in Great Britain and 304 in Northern Ireland (15+ representative sample).</p> <p>Objective: to look at Europeans' experience and perception of science and technology. All interviews were face-to-face in people's homes.</p> <p>Public views GMOs:</p> <ul style="list-style-type: none"> - 94.6% of Europeans want to have the right to choose when it comes to genetically modified foodstuffs. - 85.9% of respondents want "to know more about this kind of food before eating it". - 59.4% of Europeans believe that GMOs may have negative effects on the environment, while 28.7% have no opinion on this. <p>As to whether "GMO-based food is dangerous", this is an open question for more than a quarter of Europeans (26.5% of don't knows). But quite a large majority (56.4%) believes however that this proposition is true, as opposed to 17.1% who don't. In this case, those who claim they are informed about the various techniques differ little from those who admit their ignorance: 59.9% of the former believe that GMOs are dangerous as opposed to 53.2% of the latter.</p> <p>One third of Europeans (33.1%) endorse the statement that "the dangers have been exaggerated by the media", while 44.3% disagree. These proportions hardly vary according to socio-demographic criteria with the exception of the youngest (37.6% among the 15-24 year olds). On the other hand, this opinion is more often supported by the Danes (41.8%), the British (43.9%) and the Greeks (51.8%).</p>

6.2 Industrial and synthetic biology

Title	Type*	Produced/delivered by	date	Outline
Public Attitudes to Science 2014: Attitudes to specific science topics	survey	Ipsos-MORI	2014	<p>Representative probability sample survey of 1,749 UK (Great Britain and Northern Ireland) adults aged 16+ and a booster quota survey of 315 16-24 year-olds in the UK)</p> <p>- When looking at perceived risks and benefits among those who feel informed about synthetic biology, there is a broad relationship between feeling informed and being more favourable to this area (9% say risks outweigh benefits, 42% say benefits outweigh the risks and 61% of those who feel informed say benefits outweigh the risks)</p> <p>- As in 2011, synthetic biology continues to be a topics about which the vast majority of the public do not feel informed, regardless of their affluence. (91% don't feel informed, 8% feel informed and 61% have heard about synthetic biology). Men feel more informed about synthetic biology than women.</p>
Public views on synthetic biology	Sciencewise Social Intelligence	Sciencewise	2013	<p>Snapshot of public views on the topic of synthetic biology across the past five years (desk research review).</p> <p>People surveyed in opinion polls felt they were not sufficiently informed to weigh up the risks and benefits of synthetic biology.</p> <p>One of the outcomes of the BBSRC/EPSCRC dialogue was that members of the public felt there was an ongoing requirement for engagement as the technology develops, particularly for research councils to explain how some of the conditions participants placed on research have been met. However, stakeholder and academic communities are uncertain about how to engage with the public; though there is unanimous agreement that the public need to be engaged⁴². The stakeholder, academic and policy circles are also uncertain if a major public outcry may occur as with GM in the late 1990s and early 2000s</p> <p><i>Hopes</i> The public have high hopes for the possibilities presented by synthetic biology, Particularly in the field of medicine. Participants in dialogue activities also</p>

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				<p>expressed a hope that the technology could be used to create wealth and improve the UK's economic competitiveness. Participants demonstrated pride in the knowledge that British researchers would be pioneers in this new area.</p> <p><i>Concerns</i></p> <ul style="list-style-type: none"> - Control and regulation The need for regulation and control which could keep up with developments in the sector. Misuse of this technology is a potential concern eg bioterrorism. - "Unnaturalness"- synthetic biology could lead to the transgression of nature. Some felt uncomfortable about the ability to create living entities and "laying God". - the motivation of scientists in this sector has been questioned. Given the sense that the public consider themselves powerless to influence the sciences more generally, scientists have a responsibility to consider the wider implications of their work - environmental and health impact Broad concerns have been raised over the possibility of environmental contamination through the uncontrolled release of synthetic organisms, the effects of which were understood to be unpredictable and potentially far-reaching.
The strange new craft of making life from scratch	Media Reporting	BBC News Online	27/04/13	<ul style="list-style-type: none"> • Feature on the potential and risks of synthetic biology • BBC News Online received 20 300 000 unique browsers a week in the UK in December 2012 • 138 online comments including: enthusiasm for the field but the need for tight regulation; fear that risks will be taken, the technology will fall into the wrong hands, and 'monsters' will be created; noting that knowledge gained through genetic research has enabled us to manage any risks; concern that any benefits will only be enjoyed by a select few.
Public Attitudes to Science 2011	Survey	Ipsos Mori Social Research Institute	2011	A mixed methodology approach was used: review of the existing literature on attitudes to science in the UK and internationally; quantitative survey of the UK public and four sets of deliberative workshops; research with a cluster analysis of the quantitative data, followed by four discussion groups exploring the identified

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				<p>clusters qualitatively. 2,103 interviews conducted with UK adults aged 16+. Of these, 1,798 interviews comprised the main stage survey of adults of all ages, while 305 additional interviews were conducted exclusively with 16-24 year olds as a young people booster survey.</p> <p><i>Public views:</i> 35% say they don't know about the risks and benefits of synthetic biology.</p> <p>The cluster "concerned in science", 23% of the population, would want to hear more about the intentions of scientists, particularly those working in more controversial areas of bioscience research, such as synthetic biology or stem cells research.</p>
<p>Synthetic Biology</p>	<p>Sciencewise public dialogue</p>	<p>BBSRC, EPSRC, Sciencewise</p>	<p>2010</p>	<p>160 members of the public, 40 people in each workshop location (London, Edinburgh, Newcastle and North Wales).</p> <p>Aim: enable people to articulate their diverse views clearly and in public so future research and policies can better take account of these views.</p> <p><i>Public views:</i></p> <p><u>Conditional support</u> The public believes applications of synthetic biology to tackle food scarcity are inevitable in the face of climate change and increasing global demand for food. There was conditional support for synthetic biology: there was great enthusiasm for the potential of synthetic biology, but fears about control, who benefits, health and environmental impacts, misuse and regulation</p> <p><u>Concerns</u> - The public is apprehensive at the lack of clear 'boundaries' around what is acceptable for the potential applications of synthetic biology. - The public has clear concerns about the potential risks involved with the release of synthetic materials into the environment.</p> <p><u>Regulation</u> The public do support robust regulation which also allows for legitimate innovation and progress. For the public, the need for effective regulation and control is one of the most important issues - they do not believe scientists should self-regulate.</p>

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				<p><u>Desire to see research focused on clearly articulated societal needs</u> - The public want the opportunity to feed in their aspirations and concerns at an early stage and for Research Councils to make the science accessible.</p> <p><u>Business Participation</u> Though the public accepts that development of the technology will involve private funding, some participants fear researchers 'getting into bed with business' and innovations being taken in directions less beneficial for society.</p>
<p>Europeans and Biotechnology in 2010</p> <p>Winds of Change? Eurobarometer for EC</p> <p>(73.1)</p>	<p>survey</p>	<p>panel of experts for European Commission's Directorate-General for Research</p>	<p>2010</p>	<p>26676 reached in total, 1316 in UK. The survey questionnaire includes key trend questions, designed to assess the stability or change in aspects of public perceptions over the last ten years or more. It also includes questions that capture opinions and attitudes to emerging issues in the field of biotechnology.</p> <p>UK public views:</p> <p>The question was posed: '<i>Suppose, there was a referendum about synthetic biology and you had to make up your mind whether to vote for or against. Among the following, what would be the most important issue on which you would like to know more?</i>'</p> <p>24.4 % picked as 1st choice: 'What the possible risks are (followed by 'What the claimed benefits are' and 'What the scientific processes and techniques are'.</p> <p>23% put 'Who is funding the research' on either 1st, 2nd or 3rd place.</p> <p>41.7 % approved of synthetic biology overall, as long as this is regulated by strict laws (conditional support, anticipatory regulation)</p> <p>55 % felt that industries which develop new products with biotechnology are doing a good job for society, whereas scientist researching the topic at universities were considered to be doing a good job by 71%.</p> <p>55% think that decisions on synthetic biology should be based on research and not ethics, and should be based on the opinion of experts and not the majority (59%).</p> <p>82% feel the field of synthetic biology should be tightly regulated by Government (anticipatory regulation)</p> <p>81% say that the government is responsible for making sure everyone benefits for technological advancements (societal needs)</p>

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<p>Public perceptions of Industrial Biotechnology (IB)</p>	<p>Sciencewise public dialogue</p>	<p>Opinion Leader for the Department for Business Enterprise and Regulatory Reform (BERR)</p>	<p>2009</p>	<p>48 people reached. Citizen's Jury supported by a Project Advisory Group (PAG), made up of stakeholders.</p> <p>The research was qualitative and exploratory in nature, and sought to understand what 'excites' and 'worries' people about this emergent technology in a variety of its applications.</p> <p><i>Public views</i></p> <p>Concerns (biotechnological processes)</p> <ul style="list-style-type: none"> - unfamiliarity and fear of the unknown. <i>"We just don't know what's going into the stuff"</i> - as a 'new' science there may as yet be unknown consequences of its use. E.g. long-term health impacts that could arise by leaking by-products into the environment. <i>"We don't know what the long term effects might be"</i> In particular, a connection was made with a perceived increase in allergies and asthma in the general population, making people feel that IB could have similar long-term effects. - an overriding concern about the biotechnological process was that the science involved will go "too far" by creating something "unnatural" which could then not be reversed. (potential to interfere with nature and the natural balance) The main initial concern people had about the use of bacteria and enzymes was about changing the nature of the bacteria by making it do something it wouldn't naturally do. <i>"Where do you draw the line?"</i> - Participants mistrusted industry's role in maintaining public safety. "I still have an issue that this is eventually to make money for business and so it may be exploited and abused". There was concern over the degree of perceived autonomy allowed to industry and in some cases participants saw industry as leading the way rather than Government. Most participants understood industry as having the upper hand in IB, with other players – Government, the public – playing catch up. - cost: How much would products made using IB processes cost? Would there be hidden costs in the conversion to an IB economy? If there were cost savings, would industry 'pass them on' to the consumer? - For participants environmental statements about IB's benefits in terms of being renewable and biodegradable sounded opportunistic. At the extreme, arguments
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				<p>raised in panel sessions about the environmental benefits of IB were declared by some to be a form of “moral blackmail” or coercion.</p> <ul style="list-style-type: none"> - There was also a general concern that Government does not have enough resources to be able to properly monitor developments in IB. <p>There was a sense that, whilst Government / industry should not stand in the way of consumer choice, when this choice is difficult they would rather someone else make the decision for them.</p> <p>“Can’t we put the responsibility off of the consumer onto the producers?”</p> <p>Potential benefits:</p> <ul style="list-style-type: none"> - More efficient processes presented an appealing potential of cost savings for the consumer. (value for money) - Many saw the domestic development of emerging biotechnologies as a means by which Britain could ascend in world status. (societal needs) <p>The twin challenges presented by the economic situation and climate change led some participants to raise questions about ‘our way of life’ generally. Excess or waste were viewed with distaste. Participants raised concern that the western ‘way of life’ may be negatively affecting both the people and the environment of the rest of the world.</p>
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6.3 Agri-engineering (mainly robotics & autonomous systems)

Title	Type*	Produced/delivered by	date	Outline
Public Attitudes to Science 2014: Attitudes to robots	survey	Ipsos-MORI	2014	Questions for this chapter were asked of around a quarter (n=428) of the main sample (a representative probability sample survey of 1,749 UK (Great Britain and Northern Ireland) adults aged 16+ and a booster quota survey of 315 16-24 year-olds in the UK)

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				<p>Awareness of the different uses of robots was reflective of media coverage of these uses; awareness of manufacturing, military and space exploration uses were commonly known, whilst awareness of uses in education and care of children, older people and disabled people was low. There was widespread support for robot use in roles that were difficult or dangerous to do and considerably less support in caring roles. Those who were knowledgeable about a particular role of robots were more likely to support that use, but even amongst knowledgeable people, support for caring roles was still low. People were more definite in their views of particular applications of robots, than in a general sector. For example, people were more supportive of particular uses of robots in caring roles (i.e.: household tasks for older people), than their use in caring roles in general, and were less supportive of specific applications in military applications (i.e.: unmanned drones) than in their general use in military roles. Differences in gender and ethnic background were particularly pronounced, with men showing more support on average than women; and whites showing more supports than other ethnic groups.</p> <p>In regards to the use of robots in agriculture only 5% had read/heard a great deal about it, with 67% having heard anything at all, placing it only above education/caring in terms of awareness. Support for robot use in agriculture was high, with overall opposition being 13% and support being 66% placing it next only to space exploration, manufacturing and military and security uses in terms of support. When specific examples were listed, <i>monitoring the condition of food crops and applying water or pesticides when needed</i> received the highest support (73% support vs 12% oppose)</p>
<p>Cheltenham agri-tech discussion report</p> <p>'Farming for the future?'</p>	<p>Informal public discussion on agri-tech policy</p>	<p>Sciencewise at Cheltenham Science Festival</p>	<p>June 2013</p>	<p>'Farming for the future?' was hosted by the Science Minister, David Willetts, and managed by experts from the Biotechnology and Biological Sciences Research Council, supported by Sciencewise facilitators.</p> <p>The report is an interpretation of the discussions based on the written flip chart records and the input of the facilitation team at the event.</p> <p>There were a relatively large number of participants who identified themselves as farmers.</p> <p>Public views:</p> <ul style="list-style-type: none"> - There was <i>optimism</i> that new and emerging agricultural technologies could help increase the amount of land that it is possible to farm – for instance through salt resistant crops or satellite-guided soil diagnosis – as well as increasing the yield that

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				our existing land can provide.
Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK	Sciencewise public dialogue	Ipsos Mori for Sciencewise	2013	<p>43 participants reached in three day-long public dialogue workshops, and a half-day reconvened workshop. Quotas for gender, age, socio-economic group and ethnicity were set.</p> <p>Participants in London, Manchester and Cambridge were invited to prioritise which of the 30 issues they felt most important for Government, business and other opinion formers to consider in science policy in the next 15 years. They were also asked to identify which areas they felt it was most important for the public to be involved in, when it came to decision making.</p> <p>Public views:</p> <p>The statement regarding “machines to make decisions and carry out tasks” was controversial. Participants could see the benefits of this in some areas but were very concerned about it in others.</p> <p>They therefore thought the public should have a voice in policies about how to regulate the use of machines. This issue felt both immediate and concrete, and to have a strong ethical component.</p> <p>Participants were often concerned that the increased use of machines for these tasks would contribute to unemployment as certain labourers are replaced by robots.</p> <p>Participants also feared a decrease in human contact.</p>
Robotics and Autonomous Systems: What the public thinks	Social intelligence	Sciencewise	2013	<p>Snapshot of public views on the topic of robotics & autonomous systems -RAS (desk research review, 2007-2013).</p> <p><i>Public views:</i></p> <p>Public opinion towards RAS tends to be broadly optimistic, stating that these technologies are good for society and could solve problems but there are many issues associated with them (such as requiring careful management or having the potential to impact on employment). Some issues prove to be particularly controversial: the use of robots in warfare and care of children or the elderly; tension between fully exploiting RAS for the benefit of a growing economy (by boosting advanced manufacturing techniques with the addition of RAS) and the potential loss of jobs possibly within the manufacturing sector. Dialogue activities may help to identify where the public are most comfortable with the concept of RAS entering</p>

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				the workplace.
Public Attitudes to Science 2011	survey	Ipsos Mori Social Research Institute	2011	<p>A mixed methodology approach was used: review of the existing literature on attitudes to science in the UK and internationally; quantitative survey of the UK public and four sets of deliberative workshops; research with a cluster analysis of the quantitative data, followed by four discussion groups exploring the identified clusters qualitatively.</p> <p>2,103 interviews conducted with UK adults aged 16+. Of these, 1,798 interviews comprised the main stage survey of adults of all ages, while 305 additional interviews were conducted exclusively with 16-24 year olds as a young people booster survey.</p> <p>Public views: A few participants had concerns that prioritising certain kinds of technology might actually hinder job creation. The example given was robotics, and some participants suggested developments in this field have been at the expense of manufacturing jobs</p>
Qualitative Study on the Image of Science and the Research Policy of the European Union	survey	Optem for European Commission.	2008	<p>220 subjects in total, 8 Brits, 27 group discussions.</p> <p>A fear mentioned occasionally was the fear of seeing mankind "robotised", or of robots replacing mankind.</p>

6.4 Clean technology and energy generation from waste (mainly biofuels)

Title	Type*	Produced/delivered by	date	Outline
Bioenergy Dialogue	Sciencewise public dialogue	The data analysis was conducted by Ipsos MORI for	2013	<p>163 participants over 11 events. Highly educated sample.</p> <p>Aims:</p>

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		<p>BBSRC & Sciencewise</p>	<ul style="list-style-type: none"> • To explore with members of the public, their views in regard to bioenergy, and consider those views in our strategy and policy development in bioenergy. • To pilot a novel approach to public dialogue, to develop an on-going, informed discussion between ourselves, our research community, the public and other stakeholders, around bioenergy research. <p><i>Public views</i></p> <p><i>Hopes & expectations</i></p> <p>Participants in the dialogue event could see the potential (not guaranteed) of bioenergy to:</p> <ul style="list-style-type: none"> • Increase the amount of renewable sources in our energy supply (key positive a outlined was the fact that bioenergy is renewable) • Offer an alternative to fossil fuels and/or nuclear power • Power our transport needs • Provide cost effective fuel that uses current resources well (<i>value for money</i>) • Increase energy security through domestic and decentralised generation (<i>societal needs</i>) • Reduce carbon emissions and help tackle climate change and environmental destruction (<i>societal needs</i>) • Generate energy from currently unused resources (land and waste). <i>“It is a good way of dealing with rubbish”</i> <p>Overall, many saw bioenergy as a key part of - but not the entire solution to - our energy needs in the future. (<i>incremental change</i>)</p> <p>Many of the comments referred to the scale of our energy needs and the inability of bioenergy to do more than make a small contribution towards filling them. Many saw its main use as an alternative to fossil fuels and/or nuclear power. Others thought that using bioenergy would allow the current reserve of fossil fuels to last longer, potentially for more important uses than fuel and energy production. A handful saw it as a short-term replacement for fossil fuels, while we invest in creating more sustainable solutions</p> <p><i>Conditional support</i></p> <p>There were some added caveats around the issue of carbon debt. Often twinned with this was its sustainability, or relative sustainability in comparison to other fossil fuels.</p>
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				<p>For some, bioenergy is only seen as an environmentally constructive technology if it is “managed well” or “produced locally”.</p> <p><i>Incremental change, societal needs</i> Bioenergy is also thought to match well with our current energy infrastructure and technologies and require minimal alteration of existing fuel burning and consumption systems.</p> <p>Other potential uses of bioenergy mentioned included (<i>societal needs</i>):</p> <ul style="list-style-type: none"> • The creation of plastics and pharmaceuticals • Job creation • Wealth distribution/growth and job creation in the developing world • Increase in global cooperation. <p><i>Concerns:</i></p> <ul style="list-style-type: none"> • Transparency of motivations of bioenergy enthusiasts. There was a suspicion of private companies gaining monopolies and too much power over energy supply, and calls for strong legislation of bioenergy use and production. Some were concerned that the broader interests of society would be lost in the rush to profit, and that the underlying demand for energy was part of increasing global inequality (business participation) • Fairness of impact of bioenergy. Many urged researchers to bear in mind who has vested interests in bioenergy, what their motivations are, and who will have control and thus benefit most from any technology that researchers work on. Participants thought that researchers should consider humanity generally, taking into account social equity, and the health, cultural and social effects (societal needs) • Impact on land use and food production. Some suggested that the food/fuel conflict meant that we should stop using first generation bioenergy altogether, with the focus on bioenergy from waste or water-based products. (societal needs) • Environmental impact • Obscuring wider demand and supply side debates. Some thought that the bioenergy debate could obscure the wider demand-side debate about how to reduce our energy usage. (valuing naturalness) • Quality of long-term planning (anticipatory regulation)
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				<ul style="list-style-type: none"> • Efficiency and sustainability (risks/benefits) • International cooperation (societal needs) • Speed of progress. The worry is that the UK was being “left behind”, which could lead to negative consequences for the UK economy
Europeans and Biotechnology in 2010 Winds of Change? Eurobarometer for EC (73.1)	survey	panel of experts for European Commission’s Directorate-General for Research	2010	<p>26676 reached in total, 1316 in UK. The survey questionnaire includes key trend questions, designed to assess the stability or change in aspects of public perceptions over the last ten years or more. It also includes questions that capture opinions and attitudes to emerging issues in the field of biotechnology.</p> <p>UK public views: 30.6 % believe biofuel ‘Should definitely be Encouraged’ 43% think it should ‘Probably be encouraged’.</p> <p>For non-food biofuel sources those percentages rise to 53% and 31%.</p>
Public perceptions of Industrial Biotechnology (IB)	Sciencewise public dialogue	Opinion Leader for the Department for Business Enterprise and Regulatory Reform (BERR)	2009	<p>48 people reached. Citizen’s Jury supported by a Project Advisory Group (PAG), made up of stakeholders.</p> <p>The research was qualitative and exploratory in nature, and sought to understand what ‘excites’ and ‘worries’ people about this emergent technology in a variety of its applications.</p> <p><i>Public views</i></p> <ul style="list-style-type: none"> - Participants worried about any costs associated with adapting their current products to be able to use IB products. For example, needing to convert their cars to take biofuels or to buy new cars that can run on biofuels. - Participants were not willing to sacrifice quality. Most wanted any replacements to be at least as good as what is currently available. “Does biofuel have similar performance to ordinary fuels in your car?” <p><i>Concerns</i></p> <ul style="list-style-type: none"> -the displacement of agricultural land by the feedstocks needed to produce first generation biofuels. This was seen to have the potential to impact negatively on human populations in developing countries by taking over land that would have

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				<p>otherwise been used to produce food.</p> <ul style="list-style-type: none"> - Participants with existing knowledge on the subject of bio-fuels were very aware of the potential problems surrounding bio-fuels and the potential for further deforestation to allow bio-fuel feedstock cultivation. “Could they still be stripping down rainforests and other precious lands, where are they going to find the land, if it [bio-fuels industry] grows that big?” - Others were more concerned about impacts closer to home, in relation to the impact of biorefineries on the appearance of the physical landscape. <p><i>Hopes</i></p> <p>For many the potential for IB applications to result in less overall waste tapped into their general desire to tackle perceived over-consumption. For participants, IB could do this in a number of ways – via the efficiency of biorefineries, by the conversion of waste into biofuel, by bioplastic’s potential to extend the shelf life of food and potential to biodegrade, and through generally making a variety of industries, especially the chemicals sector, more efficient (and therefore produce less CO2).</p> <p>Biorefineries overall seemed to offer a more streamlined, efficient industrial process than that of ‘traditional’ industry.</p> <p>Given that energy costs had been steadily rising in the period preceding the research, people’s fuel bills highlighted this dependency and thus had made people more aware of energy consumption than they otherwise would have been. IB offered the potential to avoid further increases. (value for money)</p> <p>Participants welcomed biofuels’ role as part of “an energy mix”, alongside alternative energy solutions such as wind and increased energy efficiency. (valuing naturalness, incremental change)</p>
Qualitative Study on the Image of Science and the Research Policy	study	Eurobarometer Optem for European Commission	2008	<p>220 subjects in total, 8 Brits, 27 group discussions.</p> <p>Public views:</p> <p>Those who see biofuels as a development that is in principle positive, as a contribution to the problem of the scarcity and rising cost of oil (and sometimes also to the reduction in polluting emissions).</p>

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				<p>These people hardly seem to have heard about any negative impacts of this development (on the world prices for food raw materials), except for a few who are worried about this.</p> <p>A few doubts are expressed as to the true desire to continue this research or as to the action taken by the oil lobbyists to stand in its way.</p>
A Survey of Public Attitudes towards Energy & Environment in Great Britain	Opinion survey	Thomas E. Curry, David M. Reiner, Mark A. de Figueiredo & Howard J. Herzog Massachusetts Institute of Technology	2005	<p>1056 responses received from British public. The survey consisted of twenty closed-ended questions. Results are weighted based on demographic information provided by the panelists to YouGov.</p> <p>Public views:</p> <ul style="list-style-type: none"> - Respondents strongly supported the use of bioenergy/biomass, carbon sequestration, solar energy, wind energy, and energy efficient appliances and cars. - No respondents opposed the use of energy efficient cars or appliances and only a small percentage voiced any opposition to this set of technologies - By contrast, the public was more evenly divided on the question of nuclear energy, CCS and iron fertilisation, although for the latter two technologies, over fifty percent of respondents were unsure. <p>Carbon capture and storage received a slightly net favourable response, whereas nuclear energy and iron fertilisation were viewed more negatively.</p> <ul style="list-style-type: none"> - Whilst a large percentage of people responded that that they would pay an additional £5 to £20 pounds on each month's electric bill, willingness to pay drops off quickly above £20. (value for money) <p>With and without information, expanding renewable energy receives the most support as a way to combat global warming. However, when respondents were provided with cost and current production information, support for expanding nuclear energy and using fossil fuels with CCS increased dramatically. Support for nuclear energy doubles from 9 to 18% of respondents when information is provided. Support for fossil energy with CCS increases ten-fold from 1% to 10% with information.</p>

6.5 Environmental sciences

Title	Type*	Produced/delivered by	date	Outline & public views
Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK	Sciencewise public dialogue	Ipsos Mori for Sciencewise	2013	<p>43 participants reached in three day-long public dialogue workshops, and a half-day reconvened workshop. Quotas for gender, age, socio-economic group and ethnicity were set.</p> <p>Participants in London, Manchester and Cambridge were invited to prioritise which of the 30 issues they felt most important for Government, business and other opinion formers to consider in science policy in the next 15 years. They were also asked to identify which areas they felt it was most important for the public to be involved in, when it came to decision making.</p> <p><i>Public views:</i></p> <ul style="list-style-type: none"> - A key priority was to “keep the lights on whilst reducing carbon emissions”. - Participants felt that the public would be more likely to buy into policies addressing this if they had played a role in formulating them. They also thought the public needed to be educated about how their behaviours could contribute to the success of these policies. - Some participants felt there needed to be more research to understand when we might reach a tipping point in global warming.
Public Attitudes to Science 2011	survey	Ipsos Mori Social Research Institute	2011	<p>A mixed methodology approach was used: review of the existing literature on attitudes to science in the UK and internationally; quantitative survey of the UK public and four sets of deliberative workshops; research with a cluster analysis of the quantitative data, followed by four discussion groups exploring the identified clusters qualitatively.</p> <p>2,103 interviews conducted with UK adults aged 16+. Of these, 1,798 interviews comprised the main stage survey of adults of all ages, while 305 additional interviews were conducted exclusively with 16-24 year olds as a young people booster survey.</p> <p><i>Public views:</i></p> <p>The UK public interviewed generally saw medical sciences, environmental</p>

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				sciences and engineering as highly practical, because these were addressing important problems affecting people's daily lives.
Special Eurobarometer 340: Science and Technology Report	survey	TNS Opinion & Social network	2010	<p>26671 reached in total; 1311 in UK</p> <p>Public views:</p> <ul style="list-style-type: none"> - Environmental problems interest European citizens the most: 88% of respondents at the EU27 level are very or moderately interested, followed by new medical discoveries (82%) and scientific discoveries and technological developments (79%). - Europeans most indicate to feel well informed about environmental problems (78%); feeling slightly better informed about on the topic than in 2005. - Only 13% of respondents engage in signing petitions or street demonstrations on matters of nuclear power, biotechnology or the environment but 86% of respondent never did this. - On whether science will provide all the answers, Europeans on the whole have some belief that science will help but cannot solve every problem. A slim majority of 54% believe that science can sort all environmental problems, but very few - 22% at the EU27 level - agree that science can solve any problem and only 21% believe that science will lead to the world's natural resources being inexhaustible. - When we compare the 2010 findings with those of the 2005 study, we see a slight shift towards disagreement with the statement suggesting a more positive overall view of the role science and technology in environmental issues. - a clear majority of Europeans is of the view that science and technology can play a role in improving the environment. 68% of UK respondents disagree with the statement that science and technology cannot play a role in improving the environment. - Those who are more familiar and comfortable with science issues have a more positive picture of the contribution that science can play in environmental improvements. - When asked which area of research should be tackled in priority by researchers in the European Union, respondents most often mention health issues (40%), followed by energy issues (21%) and environment issues (18%).
Public	Sciencewise public	Opinion Leader for	2009	48 people reached. Citizen's Jury supported by a Project Advisory Group

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perceptions of Industrial Biotechnology (IB)	dialogue	the Department for Business Enterprise and Regulatory Reform (BERR)		<p>(PAG), made up of stakeholders.</p> <p>The research was qualitative and exploratory in nature, and sought to understand what 'excites' and 'worries' people about this emergent technology in a variety of its applications.</p> <p><i>Public views:</i></p> <p>The twin challenges presented by the economic situation and climate change led some participants to raise questions about 'our way of life' generally. Excess or waste were viewed with distaste. Participants raised concern that the western 'way of life' may be negatively affecting both the people and the environment of the rest of the world.</p>
Public Attitudes to Science 2008	survey	People Science & Policy Ltd/TNS	2008	<p>1000 reached in omnibus survey, including two questions about scientific issues people were most concerned about. A literature review of relevant research in the UK, Europe and Worldwide. Six discussion groups with a cross section of the general public – specifically to explore knowledge and familiarity with social science among the general public. 2000 in quantitative survey including boost samples of young people and ethnic minorities). Six qualitative workshops with a cross section of the public – to explore issues arising from the main quantitative survey</p> <p><i>Public views:</i></p> <p>In 2000, greatest interest in scientific topics was reported in relation to health and medical research. This remains the case in 2008 but the gap between interest in health and medical research and other scientific topics has narrowed considerably. The largest increases were seen in interest in environmental issues and energy/nuclear power issues.</p>

6.6 Health on crops and livestock

Title	Type*	Produced/delivered by	date	Outline
Citizen Dialogue on	Sciencewise dialogue	OPM group for Defra	2014	The project was carried out between September and December 2013 and engaged public and stakeholder participants in a dialogue on Defra's draft Strategy for

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<p>Bovine TB</p>				<p>achieving Officially Bovine Tuberculosis-Free status for England. The dialogue comprised three strands: ten stakeholder workshops (258 participants across ten locations), three reconvened public dialogue workshops (111 participants across three locations), and online public engagement (65 participants).</p> <p>The following themes are common across all strands of the dialogue:</p> <ul style="list-style-type: none"> • The need for effective public communication of accurate information about bTB and its controls. • Frequent cattle testing as a way to stem the spread of bTB by detecting infection as early as possible and support for increased frequency of testing in the low risk area. • Enhanced slaughterhouse surveillance. • Frustration about the length of time before a licensed cattle TB vaccination will be available for use. • A range of views about the efficacy and appropriateness of culling as part of the bTB Strategy. <p><i>(Business participation in research)</i></p> <ul style="list-style-type: none"> • Increased partnership working to contribute to a more successful Strategy. • Requests for more clarity about where responsibilities lie for managing bTB. <p><i>(Research focused on clearly articulated societal needs)</i></p> <ul style="list-style-type: none"> • The importance of working towards Officially Bovine TB Free Status for England. • Enhanced surveillance of badgers to understand transmission better. <p><i>Anticipatory regulation</i></p> <ul style="list-style-type: none"> • Encouraging farmers to adopt on-farm biosecurity measures to reduce risk of bTB infection, though views differed across strands on what this system should be.
<p>UK needs 'mega farms' to keep food prices down, say experts</p>	<p>Media Reporting</p>	<p>Guardian</p>	<p>12/11/13</p>	<ul style="list-style-type: none"> • Experts claim the UK needs more large scale farms to lower prices and improve animal welfare (from SMC briefing 'Is Big Bad?'). • Guardian daily print readership ~900 000, daily online readership ~1 200 000

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				<ul style="list-style-type: none"> 168 online comments including: questioning affiliations of experts and whether industry voices can be trusted; questioning the ethics and health/environmental impacts of larger farms; fear of moving towards a US-style system with overuse of antibiotics; questioning the premise of wanting low meat prices; concern over higher levels of cruelty associated with industrial farms.
Free-range ISN'T better than factory-farmed: Why caged chickens have 'less stressed' lives than their outdoor counterparts	Media Reporting	Daily Mail	13/11/13	<ul style="list-style-type: none"> Study finds welfare standards for free range hens can be worse than caged (from SMC briefing 'Is Big Bad?') Mail daily print readership ~4 300 000, daily online readership ~2 400 000. 406 online comments, including: incredulity and anger at result and commitment to buying free range and organic; noting health benefits of free range; asking about who funded the research and whether that had an impact on the findings; claiming it is a matter of common sense that free range hens are happier and scientific studies not needed.
Brave moo world	Media Reporting	Sun	06/08/13	<ul style="list-style-type: none"> First burger made of lab-grown meat cooked and eaten, plus scientists suggest insects may provide us with protein in our diet in coming decades. Sun daily print readership ~6 100 000, daily online readership ~200 000 9 online comments, including: enthusiasm for insect burgers; suspicion that technological advances will not be used to feed the hungry but rather to profit the developers; tentative acceptance of lab-grown meat but asking for thorough testing.
Why I've a healthy appetite for stem-cell meat	Media opinion piece	Telegraph	05/08/13	<ul style="list-style-type: none"> Prospect of lab-grown meat is good news for meat eaters, especially those with ethical qualms about meat production Telegraph daily print readership ~ 1 300 000, daily online readership ~800 000 107 online comments, including: agreement with ethical benefits and expressing openness to the idea; taking issue with pouring money into 'faux

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				<p>science hype'; scepticism that lab meat will ever come close to simulating conventional meat; fears about possible health impacts from 'unreal food'.</p>
<p>Ban pesticides linked to bee deaths, say MPs</p>	<p>Media Reporting</p>	<p>BBC News Online</p>	<p>05/04/13</p>	<ul style="list-style-type: none"> • MPs call for a ban on neonicotinoid pesticides, claiming they are responsible for declines in bee populations • BBC News Online received 20 300 000 unique browsers a week in the UK in December 2012** <p>541 online comments including: wide support for the ban; suggesting the chief scientific adviser to DEFRA's position is evidence the UK government is too close to industry; questioning researchers' independence; , that more evidence is needed' suggesting the public shouldn't use pesticides in their gardens; concern over general human impact on the environment and the importance of action.)</p>
<p>Public attitudes to agriculture, the farmed landscape and natural environment</p>	<p>Discussion paper</p>	<p>Agricultural Change and Environment Observatory</p>	<p>2010</p>	<p>This paper looks primarily at quantitative attitudinal survey data from the public / consumers (basic insight), puts individual surveys into context and also explores some techniques to add value.</p> <p>Public views:</p> <p>There was agreement that farmers should share the cost with the Government for preventing animal disease outbreaks (22% strongly agree and 33% partly agree).</p> <p>The public in the UK are comfortable with the concept of cross-compliance (EU, 2007). Large majorities felt that linking payments with certain rules for environmental, animal welfare and food safety were either "totally" or "somewhat justified". 42% thought that environmental cross-compliance was "totally justified", 52% for animal welfare standards and 61% for food safety.</p>
<p>Food risks and consumer trust. Avian influenza and the knowing and non-knowing on UK shopping floors Appetite 55</p>	<p>Academic qualitative research</p>	<p>Michiel P.M.M. de Krom, Arthur P.J. Mol</p>	<p>2010</p>	<p>52 consumers - qualitative interviews conducted in-store with consumers of a variety of poultry products at different shops: organic market, farmer's market, standard market, high-end supermarket and superstore.</p> <p>Objective: To reveal the use of information in constructing trust.</p> <p>Public views:</p> <p>The bird flu epidemic served to confirm heuristics used by consumers when they lack information, namely that:</p>

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(2010) 671–678			<ul style="list-style-type: none"> - retailers’ self-interest to retain consumer trust incites them to deliver only products that justify consumer trust - the farm-to-fork chain of free-range/organic products allows for confluences of benevolent suppliers, high levels of animal health and welfare, environmental sustainability, and food safety and quality - British or local food implicates good traceability, trustworthy food supply chain actors, (nationally or locally based) social equity, and high levels of food safety and quality, animal health and welfare, and environmental sustainability - That unprocessed products allow one to sensory determine ‘what is in it’ <p>Thus, The UK avian influenza outbreaks (concerning imported non-UK processed non-organic meat) influenced the purchasing behaviour of only two out of the 22 interviewees buying from markets. One stopped eating chicken meat for two weeks. Because chicken is a staple food, and because British meat is “the best in the world”, since government learned from previous contingencies (BSE and foot-and-mouth disease), she decided to start buying—only British—poultry meat again. The other stopped buying Bernard Matthews products for her children, because the Suffolk outbreak made her realise how little she knew about the product origin: “Due to all imports, it’s difficult for us to know where the meat comes from and whether it’s safe. And I doubt whether Bernard Matthews itself knows where all their meat comes from”.</p> <p>Ten out of the 30 interviewed supermarket consumers altered their consumption patterns in reaction to the Suffolk avian influenza outbreak, either lowering the amount of poultry products purchased, or stopped buying Bernard Matthews products. Reasons included: avian influenza was “big news”, causing a scare to emerge which made consumers doubt if poultry meat was up to food safety standards; consumers wanted “to be on the safe side, as with every scare”; or the outbreak “makes you think about what is going on” in poultry meat production. In the latter case, interviewees felt betrayed by Bernard Matthews, because its turkey meat was not purely British while they believed it was, and they did not want to support the company’s “bad [intensive farming] practices” and “poor standards” concerning animal welfare. Consumers started to buy poultry meat with normal frequencies again once government lifted contingency measures, the media reported that the outbreak was contained, or media coverage simply “died down”. Four superstore customers, however, permanently refrained from buying Bernard Matthews products, because “you just don’t know if it’s okay” and they did not want</p>
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				to be betrayed again. Consumers at the upmarket supermarket decided to carefully “choose the right place to shop’.
The proportion of people interested in improving animal welfare 2005-2009	polls	RSPCA	2010	<p>Between 2007 and 2010 a high percentage of participants (73-80%) agreed with the statement “In order for society to be truly civilised, animal welfare must be a key priority”. The question and its responses could reflect the notion that Great Britain is a ‘nation of animal lovers’.</p> <p>Animal welfare has been rated as a highly important ethical consideration. Between 2007 and 2009 there was an increase from 48 to 59 per cent of surveyed people who considered minimising unnecessary suffering to animals was important.</p>
Attitudes of EU citizens towards animal welfare	survey	Eurobarometer	2007	<p>Method: interviewing 29,152 citizens in the 25 Member States and 4 accession and candidate countries between 6 September and 10 October 2006.</p> <p>EU</p> <ul style="list-style-type: none"> • Animal welfare is seen as a matter of great importance. • Most claim to have at least a degree of knowledge of national conditions of animal welfare, but that this is limited. There is a link between respondents’ degree of education and their knowledge of welfare conditions, with those continuing education to the age of 20 and beyond the most likely (76%) to claim at least some knowledge and those ending their studies at 15 the least likely (65%). • The majority of citizens wish to be better informed about the conditions under which animals are farmed • Demographic factors are relatively unimportant in the desire for more information; much more relevant are views on the importance of the subject and current farming conditions • Sources of information on animal welfare: Television a preferred source of information, with the internet and daily newspapers also used • Most believe that animal welfare has improved in their country over the last decade. • Demographics are of slight influence, but positive opinions are largely linked to knowledge • When asked about welfare protection in the future, the vast majority of

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				<ul style="list-style-type: none"> • Europeans believe that there is a need for further improvements to be made in their country • Views on future improvements are largely determined by the importance of the subject, and existing knowledge • Farmers to take responsibility themselves for animal-friendly production (40%). Three other stakeholders are also seen as having an important role to play: veterinarians (26%), national governments (25%) and animal protection organisations (24%). The users of animal products, whether that be the food processing industry (18%), or consumers themselves (11%) are seen as being less well-placed to ensure animal welfare. • Knowledge of farming conditions leads to higher importance given to Producers • Strong endorsement of the idea of compensation - Do you believe that farmers should be financially compensated for any higher production costs linked to farming animals under more welfare-friendly conditions • Consumers most likely to buy animal-friendly produce because it is seen as healthier and high quality • Consumers indicate they would be prepared to change shopping habits - Willingness to change shop to buy animal-friendly products- Most consumers say it is hard to find information on product sourcing • Difficulty in finding information is reflected in views on information conveyed by current labelling • Labelling is seen as the best means of identifying product sourcing • Text more universally understandable than logos, and appeals more to those interested in welfare <p>UK specific data</p> <p>UK was in the group of countries with information saturation about <i>animal welfare</i>: existing knowledge is higher than average, but respondents are less receptive to being given further information.</p> <p>In the UK Internet as preferred source of information on animal welfare was higher than in most countries (48%). This is most likely linked to high internet penetration rates (at the date of the survey).</p>
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<p>Consumers' views about farm animal welfare – 3. United Kingdom</p>	<p>Focus group</p>	<p>Welfare Quality reports n4 (EU FP6 project)</p>	<p>2007</p>	<p>Seven focus groups in March 2005; the first four in Reading (Urban, South), the next two in Leeds (Urban, North), and the final one in Earlsfield (Rural, Midlands). 8-10 participants per group.</p> <ul style="list-style-type: none"> - Most consumers stated that they were concerned about animal welfare. - People, especially children (according to the adults in the focus groups) felt more sentimentality towards farm animals now than previous generations, because of the increased distance between urban and rural life. - The different groups focussed on different attributes when shopping for meat, but the general concern was mainly with nutritional issues and other health and safety issues (particularly BSE), followed by appearance. - The biggest barrier to non-purchase of welfare-friendly products was price, although trust and lack of time to look at labels were also high on the list. Other barriers were lack of information, and also the disassociation of production from animal welfare, where consumers were not thinking about the fact that meat comes from farm animals and the resulting welfare issues of animals when purchasing meat. - The only welfare-friendly products commonly purchased were free-range eggs. The reasons for this were that they are clearly labelled, everyone had a good idea of the welfare issues regarding cage eggs, and they were not very much more expensive. - There often appeared to be a link between the ethical and health reasons for buying welfare-friendly products, because the assumption was that if an animal had been treated better, it would be healthier to eat. - The only product commonly avoided for welfare reasons was veal, although a few people also avoided non-organic or non-free-range chicken. - Information on the impact of farming systems on animal welfare was gained from the media (television documentaries, radio programmes, and newspaper articles) and this did seem to have an effect on the consumers purchasing habits. - There was very little knowledge of welfare labelling apart from that for eggs.
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				<p>Only one participant had heard of the RSPCA Freedom Foods and one of the Red Tractor logo.</p> <ul style="list-style-type: none"> - Most people are interested to know more about the animal welfare issues but are not prepared to actively search for information. - Generally it was thought that a single EU welfare standard would be a good idea and that its attainment should be recognisable by a single standard logo on products. - There was a call for simplification of labelling and provision of clear information so that the labels could be easily understood. - Some thought that all products should be produced to such a standard and that there should be no market for sub-standard goods. It was suggested that this should be put into place by the government. - There were varying levels of trust for different actors, although supermarkets were universally distrusted. Several groups came up with the idea that any standard should be under the administration of a group representing all the separate actors throughout the food chain, so that no one group would dominate. - It was generally thought that the Government should take responsibility for the issue of animal welfare, and that it should not be left to the consumer. There was a consensus that, as people find it hard to choose welfare-friendly goods when they are on a budget, they would in fact rather not have the choice and thus be forced to 'do the right thing'.
Consumer Concerns about Animal Welfare and the Impact on Food Choice	EC report	Gemma Harper, Spencer Henson Centre for Food Economics Research (CeFER)	2001	<p>The first stage of the project involved a thorough review of the literature on the demand for animal products; consumer concerns about animal welfare and previous research on consumer concerns about animal welfare issues of all types.</p> <p>A series of four focus groups was conducted in two locations in each of the five study countries. 500 reached in 5 countries (United Kingdom, Ireland, Germany, France and Italy) in the sample survey - nationally representative sample of consumers.</p> <p>The overall objective of the project is to assess the nature and magnitude of consumer concerns about animal welfare within a cross-section of EU member</p>

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				<p>states (, assess the impact on choice of animal based food products and suggest strategies by which consumer concerns can be addressed.</p> <p>Public views:</p> <p><i>Valuing naturalness</i></p> <p>Consumers define animal welfare in terms of natural lives and humane deaths. In essence, this means that animals should be reared, fed, housed, reproduced and allowed to behaviour as close to natural conditions as possible. Consumers equate natural production methods with safer food quality.</p> <p>The survey supported high levels of concern about animal welfare. However, it also revealed that the recent <i>changes in consumption patterns</i>, especially from red meat to white meat, were almost wholly motivated by anthropocentric concerns, such as human health, food safety, and changes in lifestyle.</p>
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6.7 Nutrition and human nutrition, functional foods and nutraceuticals

Title	Type*	Produced/delivered by	date	Outline & public views
Consumers and new food technologies Trends in Food Science & Technology 22 (2011) 99-111	Academic review	Fanny Rollin, Jean Kennedy and Josephine Wills European Food Information Council (EUFIC)	2011	<p>Literature review.</p> <p>Aim: To describe the current landscape in Europe within which emerging food technologies are developed and applied, and to give insights from other parts of the world.</p> <p>Consumers' attitudes towards emerging food technologies are described, with a focus on five case-studies; nanotechnology, genetic modification, nutrigenomics, food irradiation and animal cloning.</p> <p>Public views:</p> <p>66.6% of European respondents reported that they would be willing to undergo genetic testing and 27% to follow a personalised diet</p> <ul style="list-style-type: none"> - Willingness to undergo genetic testing was lower in Germany and higher in the UK. - individuals who answered positively were more likely to report a history of

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				health problems.
Public Attitudes Toward Molecular Farming in the UK	Academic research	Richard Milne, University College, London	2009	<p>- Focus group study: Six groups were constituted from 35 individuals with between four and nine participants in each group</p> <p><i>Public views:</i></p> <p>- There is a positive view that molecular farming has the potential to be a useful development in medical response to diseases.</p> <p><i>Concerns:</i></p> <p>-the choice of crop for molecular farming is important, but drawing the line between food and non-food is not simple.</p> <p>- Containment is crucial for the introduction of plant-made pharmaceuticals, preferably in greenhouses.</p> <p>- Plant-made pharmaceuticals must be thoroughly tested before introduction.</p> <p><i>Regulation</i></p> <p>- Specific regulation addressing molecular farming is necessary. The preference of growing location for pharmaceutical crops is influenced by the perceived strength of regulation.</p>
Functional food. Product development, marketing and consumer acceptance—A review Appetite 51 (2008) 456–467	Academic review:	Istvan Siro, Emese Kapolna, Beata Kapolna, Andrea Lugasi	2008	<p>Brief overview of the current functional food market situation in USA, Japan and some European countries and offer some comments on functional food future potential. The paper explores the main challenges of such product development focusing on the different factors determining the acceptance of functional food.</p> <p><i>Findings</i></p> <p>Germany, France, the United Kingdom and the Netherlands represent the most important countries within the functional food market in Europe.</p> <p><i>Public views</i></p> <p>In the United Kingdom, France and Germany, up to 75% of the consumers have not heard about the term “functional food”, but more than 50% of them agree to fortify functional ingredients in specific food products</p>
Public Attitudes	survey	People Science &	2008	1000 reached in omnibus survey, including two questions about scientific issues people were most concerned about. A literature review of relevant

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to Science 2008		Policy Ltd/TNS		<p>research in the UK, Europe and Worldwide. Six discussion groups with a cross section of the general public – specifically to explore knowledge and familiarity with social science among the general public. 2000 in quantitative survey including boost samples of young people and ethnic minorities). Six qualitative workshops with a cross section of the public – to explore issues arising from the main quantitative survey</p> <p>Public views: Conflicting information was a recurring theme in the group discussions and led some people to disengage with science, especially those aspects of science that impact on their daily lives such as health and nutrition advice.</p>
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6.8 Food science, food and farming supply chain

Title	Type*	Produced/delivered by	date	Outline & public views
<p>Cheltenham agri-tech discussion report</p> <p>‘Farming for the future?’</p>	Informal public discussion on agri-tech policy	Sciencewise at Cheltenham Science Festival	June 2013	<p>Farming for the future?’ was hosted by the Science Minister, David Willetts, and managed by experts from the Biotechnology and Biological Sciences Research Council, supported by Sciencewise facilitators.</p> <p>The report is an interpretation of the discussions based on the written flip chart records and the input of the facilitation team at the event.</p> <p>There were a relatively large number of participants who identified themselves as farmers.</p> <p>Public views: Multiple views emerged around the concept of self-sufficiency versus the need to feed the UK and import food. (societal needs)</p> <p>One group was keen for Europe for become a ‘seed-bank’ of traditional varieties and practices for the rest of the world, but was less keen for the UK to be part of that Europe.</p> <p>Experts tended to focus on yields and increasing production of food. The participants queried this on two levels:</p> <ul style="list-style-type: none"> - Should our focus in fact be on reducing waste and rebalancing existing

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				<p>inequalities in distribution? (fulfilling societal needs)</p> <ul style="list-style-type: none"> - Should there be more focus on quality over quantity? <p>People saw a role for government in helping maintain trust in the system of food production, this included holding business to account for their practices. One group suggested that trustworthy behaviour can be forced on to organisations by public pressure.</p> <p><i>Business Participation</i></p> <ul style="list-style-type: none"> - Supermarkets drive consumers to certain practices/products - Control of the farming/food system needs to be spread such that no one actor has too much power - Broad agreement that, as the strategy is firmed-up and rolled out, there should be participation of a broad range of groups and people - Feelings expressed that many outcomes have been pre-determined by political and economic interests - that Government and industry will get their desired outcome regardless. <p><i>Regulation</i></p> <p>There needs to be an appropriate balance between cumbersome regulation and effectiveness.</p>
FSA – consumer attitudes to towards the horse meat contamination issue	FSA consumer survey	FSA (Food Standard Agency)	February 2013	<p>1,527 interviews in online UK survey</p> <p>Main objectives:</p> <ul style="list-style-type: none"> - Gauge consumer understanding and reaction to information and messages on the current horse meat contamination issue - Understand whether consumer confidence in food safety has been affected by the current incidence of horse meat contamination - Understand consumer views in relation to messaging and advice the FSA has been issuing to inform consumers about the safety of processed meat <p>Public views:</p>

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				<p>- 64% find the stories about the issue 'concerning'</p> <p>"I feel let down by people trusted to provide what I expect. I don't think I can shop without concern about what is in my food anymore."</p> <p>- 73% now feel less confident in the safety of processed meat</p> <p>"It's appalling that one cannot confidently rely on the information on a label! It is not a matter of caring what I am sold, as much as KNOWING what I'm sold, and to mislead the public in this respect is sheer fraud, whether or not one would willingly eat the product if one did know."</p> <p>- 79% think horse meat has been sold for years to consumers in products where it is not listed on the label</p> <p>- 49% will now buy less red meat, processed meat and/or ready meals. 67% of those intending to buy less say it's due to lack of trust.</p> <p>Knowledge and concern is driven by older people and females. Women and older people more likely to change future purchase behaviour, with reduced purchasing of red/processed meat and value options</p> <p>Blame for the contamination issue is considered to lie with the food manufacturers</p>
The Future of Food	Deliberative dialogue projects	Which? (Community Research)	Apr 2013	<p>- Research involved four citizens' juries held in Belfast, Cardiff, Glasgow and London. 12-14 people, broadly representative of different groups of the population, met over two days in each location. Public views:</p> <p><i>Conditional support</i></p> <p>- People felt that the future was not about one particular approach or system of farming. Organic may have a role, but won't be enough and advantage needs to be taken of science and technology. They thought a clearer strategy for what can be grown most efficiently in different regions was needed.</p> <p>- Some do not like the idea of GM (largely on ethical grounds and because of</p>

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				<p>concerns about longer-term unintended consequences), but if adequate checks are in place some are willing to see it as an option.</p> <ul style="list-style-type: none"> - People warned against false promises – new technologies proposed need to be realistic and offer real benefits for UK consumers. <p><i>Concerns</i></p> <ul style="list-style-type: none"> - People were oblivious to many of the issues, particularly around food security and sustainability, but became very engaged once they were explained and felt that others need to be better informed. Clearer advice as well as in-store information and labelling, was wanted by many participants. - People wanted more information about the tests carried out on genetically modified (GM) crops - Consumer interests are not being given enough priority by decision-makers. There is a lack of consumer focus in the way that policy is developed, the way that responsibilities are split across government and a more general failure to listen and respond to consumer views about the different issues that need to be addressed. <p><i>Desire to see research focused on clearly articulated societal needs</i></p> <ul style="list-style-type: none"> - Government strategy should be built on deliberative research methods and a broader based public engagement initiative around the future of food. - there needs to be a much more transparent and open exploration of the role of new technologies compared to other options for UK food production going forward. This includes addressing research needs and ensuring consumer choice. <p><i>Regulation</i></p> <ul style="list-style-type: none"> - People expected effective, independent regulation of new technologies. - Regulation should not automatically be seen as a burden and a light touch approach to enforcement needs to end. Effective, targeted controls across the supply chain benefit consumers and the food industry. They must be effectively implemented and enforced so that there are much stronger deterrents for failure to comply with legislation and deliberate fraud. <p><i>Value for money</i></p> <ul style="list-style-type: none"> - The price of food was (initially) the dominant concern for most people although they were generally unaware of the issues underpinning food price volatility.
Horse meat in	Media reporting	Daily Telegraph	17/01/13	<ul style="list-style-type: none"> • Horsemeat in burgers could be unsafe to eat if from diseased or injured

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burgers 'could be health risk'				<p>animals say environmental health officers</p> <ul style="list-style-type: none"> • Telegraph daily print readership ~ 1 300 000, daily online readership ~800 000*. • 324 online comments, including: incredulity that regulations were not adhered to; linking scandal to BSE crisis and voicing fears of further impacts on public health; suspicion that problem is restricted to beef products; cynicism about giving credence to reported health risks.
Call to beef up DNA testing as horsemeat scandal forces shops to clear shelves	Media Reporting	Times	17/01/13	<ul style="list-style-type: none"> • Politicians and supermarket executives call for more DNA testing of food after removal of burgers contaminated with horsemeat. • Times daily print readership ~1 200 000, daily online readership ~40 000. • 73 online comments, including: encouraging others to buy from local butchers; cynicism that the media have hyped the scandal; confidence in overall British food safety record; support for better labelling and regulation.
UK needs 'mega farms' to keep food prices down, say experts	Media Reporting	Guardian	12/11/13	<ul style="list-style-type: none"> • Experts claim the UK needs more large scale farms to lower prices and improve animal welfare (from SMC briefing 'Is Big Bad?'). • Guardian daily print readership ~900 000, daily online readership ~1 200 000 • 168 online comments including: questioning affiliations of experts and whether industry voices can be trusted; questioning the ethics and health/environmental impacts of larger farms; fear of moving towards a US-style system with overuse of antibiotics; questioning the premise of wanting low meat prices; concern over higher levels of cruelty associated with industrial farms.
Europeans' Attitudes towards Food Security, Food Quality and the Countryside	Eurobarometer	TNS Opinion & Social network on behalf of Directorate-General for Agriculture and Rural Development	2012	<p>1.305 respondents reached in UK, 26.593 respondents across the 27 Member States of the European Union.</p> <p>The aim of the survey is to understand EU citizens' experiences and perceptions of food security and self-sufficiency. The survey also looks at consumer priorities when buying food, awareness of quality labels and perceptions of the link between agriculture and the preservation of nature and countryside.</p> <p>Interviews were conducted face-to-face at home in the respondent's mother</p>

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				<p>tongue.</p> <p>Public views:</p> <ul style="list-style-type: none"> - origin of food is important to 52% of British respondents.45% don't mind. - 66% of UK respondents rate quality of food as very important. - 63% of those interviewed in the UK check quality labels at least sometimes, 24% always. <p>Quality, price and origin are considered important in most Member States with price being especially important for those citizens who have difficulties paying bills.</p> <p>Only a minority of EU citizens recognise logos of EU food quality assurance schemes.</p>
Public Attitudes to Science 2011	Ipsos Mori 2011	Ipsos Mori Social Research Institute	2011	<p>A mixed methodology approach was used: review of the existing literature on attitudes to science in the UK and internationally; quantitative survey of the UK public and four sets of deliberative workshops; research with a cluster analysis of the quantitative data, followed by four discussion groups exploring the identified clusters qualitatively.</p> <p>2,103 interviews conducted with UK adults aged 16+. Of these, 1,798 interviews comprised the main stage survey of adults of all ages, while 305 additional interviews were conducted exclusively with 16-24 year olds as a young people booster survey.</p> <p>Public views:</p> <p>Some older participants identified specific sectors in the economy that they felt benefited from scientific developments, such as the food sector.</p> <p>There was also a sense that the workshop discussions had left participants more in favour of the public funding of science, because they had a greater idea of how wide its impact was on other sectors, such as food production or health.</p>
Food risks and consumer trust.	Academic qualitative research	Michiel P.M.M. de Krom, Arthur P.J.	2010	<p>52 consumers - qualitative interviews conducted in-store with consumers of a variety of poultry products at different shops: organic market, farmer's market,</p>

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<p>Avian influenza and the knowing and non-knowing on UK shopping floors Appetite 55 (2010) 671–678</p>		<p>Mol</p>	<p>standard market, high-end supermarket and superstore.</p> <p>Objective: To reveal the use of information in constructing trust.</p> <p><i>General supply chain public views:</i></p> <p>Some customers only buy at market vendors because these have fresher and higher quality produce than supermarkets, and are involved in shorter supply chains than supermarkets (as long supply chains equal a lack of knowledge of foodstuff's provenance and forestall supporting local producers).</p> <p>The farmer's market vendors' products were particularly appreciated for being tastier, cheaper, fresher, and to be containing less 'contaminations', including pesticides and chemicals, than other (especially supermarket) poultry meat.</p> <p>Intentions to meet animal welfare, environmental (reducing food miles), and social (stimulating local economies) concerns were further important reasons to buy products at the market vendors.</p> <p>Consumers at the farmers' market stipulated that farmers and consumers are to co-operatively countervail the power of supermarkets, which pay unfair prices to farmers and incite declines in product quality.</p> <p>On the one hand, consumers tended to blame government for stimulating imports rather than local farmers, and cheap instead of high-quality food. Government is to provide more support to local, and free-range organic farmers by means of marketing assistance, advice, standardising labels, and limiting supermarket power over suppliers. On the other hand, some consumers held government responsible for assuring food quality, by regularly controlling whether vendors abide to health and safety regulations.</p> <p>The majority of consumers purchasing at the upmarket supermarket indicated to only buy free-range/organic or intermediate segment poultry meat. These consumers' choices for a point-of-sale were depending on whether shops act 'ethically' towards their suppliers and allow consumers to support specific (British/local, free-range/organic producing) suppliers, combined with reasons of convenience or 'happenstance'.</p> <p>All interviewed consumers argued that the supermarket and its suppliers are to a large degree responsible for assuring that food meets consumers' requirements. These actors should provide accurate information on the origin of products: "with the meat scares. . .we need to know how it is reared, and</p>
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				<p>where—the country of origin”.</p> <p>Products should preferably be nationally or locally sourced, so that UK and local economies are supported, and food safety can be assured through well-functioning traceability mechanisms.</p>
<p>Qualitative Study on the Image of Science and the Research Policy of the European Union</p>	<p>Eurobarometer</p>	<p>Optem for European Commission.</p>	<p>2008</p>	<p>220 subjects in total, 8 Brits, 27 group discussions.</p> <p>Public views:</p> <p>Food products are an especially sensitive area for European consumers, and that concerns are already widespread amongst them as regards the “black box” that constitutes the food chain— even setting aside the question of GMOs.</p> <p>Agriculture and the agro-food industry are occasionally mentioned as areas in which common European research should be oriented as a priority, after medicine, biology, pharmaceuticals, energy(ies), environment and climate.</p> <p>A few participants stated concerns on “artificial” agro-food production methods not linked to genetic modification.</p>
<p>Eurobarometer 55.2: Europeans, Science and Technology</p>	<p>Eurobarometer</p>	<p>European Commission Research Directorate-General</p>	<p>December 2001</p>	<p>A total of 16 029 people were questioned, of which 1 000 in Great Britain and 304 in Northern Ireland (15+ representative sample).</p> <p>Objective: to look at Europeans' experience and perception of science and technology. All interviews were face-to-face in people's homes.</p> <p>Public views:</p> <p>The agri-food industry is most often considered to bear most of the blame for the mad cow affair: 74.3%. Next come politicians (68.6%), farmers (59.1%) and scientists (50.6%). Finally, 44.6% of respondents felt that they did not have enough information to say who was responsible.</p> <p>A large majority of Europeans (78.3%) refuse to believe that mad cow disease would not be a threat to man.</p>

6.9 General (agri-tech, agriculture, food)

Title	Type*	Produced/delivered by	date	Outline
Public Attitudes to Science 2014: Attitudes to agri-science and food security	Survey	Ipsos-MORI Social Research Institute	2014	<p>Questions for this chapter were asked of around a quarter (n=455) of the main sample. The main sample consisted of a representative probability sample survey of 1,749 UK (Great Britain and Northern Ireland) adults aged 16+ and a booster quota survey of 315 16-24 year-olds in the UK.</p> <p>Public attitudes: Whilst people see food security as an important issue both globally and nationally, they tend not to see it as scientific issue, but rather a political or economic issue. Whilst people see global food security as an important issue currently, they see national food security as becoming more important in the longer term. Many do not think that the government is doing enough to ensure food security in the future. A large majority of people think that all agricultural technologies should be considered to help secure world food production, but this confidence wanes when discussing GM crops specifically. It is noted that people would engage more with agri-science if GM crops were seen as one of many technologies being put forward to help improve food security. In regards to GM crops, feeling informed doesn't necessarily mean being informed, nor does it necessarily lead to more support for the technology.</p>
Dialogue on outputs from a workshop on Science, Policy-making and Public Dialogue: New and emerging issues in the UK	Sciencewise public dialogue	Ipsos Mori for Sciencewise	2013	<p>43 participants reached in three day-long public dialogue workshops, and a half-day reconvened workshop. Quotas for gender, age, socio-economic group and ethnicity were set. Participants in London, Manchester and Cambridge were invited to prioritise which of the 30 issues they felt most important for Government, business and other opinion formers to consider in science policy in the next 15 years. They were also asked to identify which areas they felt it was most important for the public to be involved in, when it came to decision making.</p>

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				<p>Public views:</p> <ul style="list-style-type: none"> - Feeding a larger and more wealthy global population was perceived as a priority issue. Participants perceived this issue as urgent and as having a direct impact on them physically and economically. Food was seen as a 'life and death' issue – and therefore ensuring everyone has enough to eat is one of the most important things. - Participants were also very concerned with the injustices they see in the global food system, with some populations eating larger quantities of food, more meat, and particularly wasting food, while others do not have enough to eat. - They spontaneously raised the issue that increased urbanisation will lead to more building on green spaces and were concerned that there will be depletion of resources and competition for land between residential, agricultural and other uses. There will be less countryside and green space to enjoy which will negatively impact on well-being. - There are ingrained myths that, for example, the UK could easily grow all its own food and that individual actions, for example buying local or having an allotment, would help solve wider problems like climate change.
<p>Cheltenham agri-tech discussion report</p> <p>'Farming for the future?'</p>	<p>Informal public discussion on agri-tech policy</p>	<p>Sciencewise at Cheltenham Science Festival</p>	<p>June 2013</p>	<p>'Farming for the future?' was hosted by the Science Minister, David Willetts, and managed by experts from the Biotechnology and Biological Sciences Research Council, supported by Sciencewise facilitators.</p> <p>The report is an interpretation of the discussions based on the written flip chart records and the input of the facilitation team at the event.</p> <p>There were a relatively large number of participants who identified themselves as farmers.</p> <p>Public views:</p>

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			<p>It was felt that new technologies, such as genetic modification, should work alongside other farming practices like Organic farming, which was also seen to be making technological advancements, for instance in integrated pest management. (<i>Valuing naturalness, incremental solutions</i>)</p> <p>The role of agricultural technologies were seen as being able to help address the issues of producing enough food for the growing population. However, people noted that food security is a complex problem and perhaps not best fixed by producing more food.</p> <p>People discussed how our habits, as in how we behave, are part of the background context in which the development of the agri-tech strategy fits. There was some discussion around how it may be necessary for us to change our diet and reduce how much food we waste. (<i>valuing naturalness</i>)</p> <p>Changes in land-use were seen as inevitable. There was a recognition that changes in land-use to increase food production need to be considered against what is lost and balanced with the fact that land is a commodity with value. (<i>risks/benefits, valuing naturalness</i>)</p> <p>People thought that the UK's excellent science is currently not translated into practice on the farm as efficiently as it could be and this meant that UK farming risks getting left behind. Participants were keen that the agri-tech strategy was written with an understanding of current farming practice and were concerned that existing skills such as horticulture were not valued as much as they needed to be. The question whether farmers should be involved in reviewing research. (<i>conditional support</i>)</p> <p>There was some discussions around the role of technology in helping to address challenges. Participants spoke of 'techno-fixes' not always being appropriate tools with which to address</p>
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				<p>issues. (valuing naturalness)</p> <p>Concerns were raised that unintended consequences of new technologies were not considered carefully and that risks as well as benefits should be assessed more thoughtfully. (risks/benefits, anticipatory regulation)</p> <p>In at least one group there was a feeling that many outcomes have been pre-determined by political and economic interests - not a suggestion the discussion was pointless, more that Government and industry will get their desired outcome regardless. (business participation)</p> <p>UK research should help address global challenges. (societal needs)</p> <p>While researchers were generally respected and seen as trustworthy some participants noted that in reality the world of research is very competitive and this can lead to “skulduggery”. People distinguished between types of scientists: government scientists are perceived as trustworthy but slow and lazy while scientists working for big companies were not trusted. Concerns were raised over the selective publishing of research results, especially of industry funded research. (business participation)</p> <p>There was call for a clear vision for agri-tech and for a focus on evaluating the successful delivery of the vision over many years. (anticipatory regulation)</p>
Global Food Security Programme –	Dialogue	TNS for Global Food Security	2012	Study included 44 people sampled from across age, gender, socio-economic status and ethnicity, in a 2-step workshop process from 3 locations across England, Scotland and Wales

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Exploring public views				<p>(London, Edinburgh, Aberystwyth). The first workshop explored public framing of issues, and the second explored potential future research. Aim of the study was to influence GFS funding strategy via consideration of public views, aspirations and concerns around research to help address global food security.</p> <p>Key findings:</p> <ul style="list-style-type: none"> - Focus was on domestic, rather than global food issues, suggesting a need to relate global consequences on local choices - View that an innovation-led approach was not sustainable - Views that different technologies should not be a choice against another, and that biotechnologies should not dominate over technical on agenda - View that there was a differences in GFS's take on issues (mostly technical) compared to public view, which was mostly centered on power, ethics and behaviours - Resource efficiency was seen as rather abstract, suggesting a different engagement dialogue should be taken - More importance was placed on outcomes with practical applications, rather research aiding understanding, however, high priority was placed on generating public awareness
<p>Europeans' Attitudes towards Food Security, Food Quality and the Countryside</p>	<p>Eurobarometer</p>	<p>TNS Opinion & Social network on behalf of Directorate-General for Agriculture and Rural Development</p>	<p>2012</p>	<p>1.305 respondents reached in UK, 26.593 respondents across the 27 Member States of the European Union (face to face interviews).</p> <p>The aim of the survey is to understand EU citizens' experiences and perceptions of food security and self-sufficiency. The survey also looks at consumer priorities when buying food, awareness of quality labels and perceptions of the link between agriculture and the preservation of nature and countryside.</p>

Agri-technologies: what the public say

				<p>Public views:</p> <ul style="list-style-type: none"> - 87% of respondents in the UK agree that agriculture is beneficial for the environment - 85% of respondents in the UK agree that agriculture contributes to the beauty of the countryside - 88% of respondents in the UK agree that agriculture helps to preserve and protect rural areas <p>In the EU, respondents with 20 or more years of education and those who are still studying are somewhat less likely to say that agriculture is beneficial for the environment: in both groups 73% of those polled agree with this, compared with the EU average of 81%.</p>
<p>Consumers and new food technologies Trends in Food Science & Technology 22 (2011) 99-111</p>	<p>Academic review</p>	<p>Fanny Rollin, Jean Kennedy and Josephine Wills</p> <p>European Food Information Council (EUFIC)</p>	<p>2011</p>	<p>Literature review.</p> <p>Aim: To describe the current landscape in Europe within which emerging food technologies are developed and applied, and to give insights from other parts of the world.</p> <p>Consumers' attitudes towards emerging food technologies are described, with a focus on five case-studies; nanotechnology, genetic modification, nutrigenomics, food irradiation and animal cloning.</p> <p>Public views:</p> <p>European consumers still tend to associate more negative than positive attributes to agro-biotechnology in general, such as wariness, unease and uncertainty.</p> <p>However, there are minorities with strongly positive or negative opinions, and a majority who are undecided or feel that they don't know enough to form a view.</p>
<p>Public attitudes to agriculture, the farmed landscape and natural</p>	<p>Discussion paper</p>	<p>Agricultural Change and Environment Observatory</p>	<p>2010</p>	<p>This paper looks primarily at quantitative attitudinal survey data from the public / consumers (basic insight), puts individual surveys into context and also explores some techniques to add value.</p>

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<p>environment</p>				<p>Public views:</p> <ul style="list-style-type: none"> - The public tend to look upon farmers as respected members of society. As an industry, farming itself is also regarded as generally important. - A thriving farming industry in England is „very important“ to 79% of people interviewed and for 19% „quite important“. (Defra, 2008a) - 77% of residents of the UK think European agriculture and the rural areas were important „for our future“. (EC, 2007) - 59% strongly agreed and 27% slightly agreed with the statement „Britain should remain a strong farming nation“ and a high percentage (75%) agreed that „without farming Britain would be a worse place“. (IGD, 2005) - The relatively high level of financial support, initially for incentivising production and in more recent years to improve environmental sustainability still has a high level of public acceptance. <p>However this financial support should be for looking after the land in an environmentally-friendly way but not for production purposes or during a crisis (26% strongly agree, 33% partly agree).</p> <p>Interestingly and importantly, this financial support from the public purse comes with some understanding that some societal return is expected.</p> <p>The highest farmer roles and responsibilities accorded respectively to producing quality food and provide food that meets the needs of British shopper (Defra, 2008a, IGD, 2008). (societal needs)</p> <p>-When presented with options between environmental objectives and wider social objectives (such as providing for leisure opportunities and maintaining a way of life) and food production, producing food is significantly (and unsurprisingly)</p>
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				<p>more desirable as a primary objective.</p> <p>However the nature of quantitative surveys do not effectively examine the complexity surrounding trade-offs e.g. balance between food and social or environmental objectives. Although only 5% of respondents chose (as a first option) to preserve a traditional way of life (IGD, 2008) this does not mean that the public does not regard wider social objectives as unimportant as in an earlier survey (IGD, 2005) 84% agreed with the statement: it is important to support British farming otherwise we would lose a traditional way of life.</p> <p>- Understandably, the availability of food is a priority for consumers as it is something they are concerned with on a daily basis. However, this does not necessarily imply that increasing food production is also a priority. 75% agreed that protecting the countryside was most important compared to 15% for cheaper food (Defra, 2006).</p> <p>-The major change in public funding for agriculture has been a gradual transition over 20 years away from support mainly for food production towards support for maintaining or improving environmental assets. Measures of public opinion coincide with this period of policy transition (Countryside Agency, 2002). In 1985, 53% agreed with the statement: if farmers have to choose between producing more food and looking after the countryside they should produce more food but by 1999 this had declined to 31%. The biggest change came between 1985 and 1989 (53% to 36%) with the results reflected in other questions. Between 1985 and 1989 there was also a significant increase in those agreeing that Government should withhold some subsidies from farmers and use them to protect the countryside, even if this leads to higher prices (47% to 60%) and that modern methods of farming have caused damage to the countryside (63% to 72%).</p>
Europeans and Biotechnology in 2010	Eurobarometer for EC (73.1)	panel of experts for European Commission's Directorate-General for	2010	26676 reached in total, 1316 in UK. The survey questionnaire includes key trend questions, designed to assess the stability or change in aspects of public perceptions over the last ten

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<p>Winds of Change?</p>		<p>Research</p>		<p>years or more. It also includes questions that capture opinions and attitudes to emerging issues in the field of biotechnology.</p> <p>UK public views:</p> <p>While entrenched views about GM food are still evident, the crisis of confidence in technology and regulation that characterised the 1990s – a result of BSE, contaminated blood and other perceived regulatory failures – is no longer the dominant perspective. In 2010 we see a greater focus on technologies themselves: are they safe? Are they useful? And are there 'technolite' alternatives with more acceptable ethical-moral implications? Europeans are also increasingly concerned about energy and sustainability.</p> <p>There is no rejection of the impetus towards innovation: Europeans are in favour of appropriate regulation to balance the market, and wish to be involved in decisions about new technologies when social values are at stake. (societal needs, anticipatory regulation)</p>
<p>Eurobarometer 55.2: Europeans, Science and Technology</p>	<p>Eurobarometer</p>	<p>European Commission Research Directorate-General</p>	<p>2001</p>	<p>A total of 16 029 people were questioned, of which 1 000 in Great Britain and 304 in Northern Ireland (15+ representative sample).</p> <p>Objective: to look at Europeans' experience and perception of science and technology. All interviews were face-to-face in people's homes.</p> <p>Public views:</p> <p>The belief that "science and technology are going to improve agriculture" is shared by 59.0% of Europeans. This belief is very widely held among the European public.</p>
