The HIDDEN COST of UK FOOD

SUMMARY REPORT
November 2017
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EXECUTIVE SUMMARY

This report finds that the food we eat costs us about twice as much as it appears in our shopping bills.

For every £1 UK consumers spend on food, additional costs of around £1 are incurred. These costs are not paid by the food businesses, nor are they included within the retail price of food. Instead they are passed on to society in a range of hidden ways.

In total, production-related costs account for an extra 50p for every £1 spent on food, while the costs of diet-related disease account for an extra 37p.

One surprising conclusion is that farm support payments account for only 2.5p in every hidden £1 spent on food.

Breakdown of every hidden £1 spent on food:
- Natural capital degradation 25.7p
- Biodiversity loss 10.6p
- Production-related ill-health 13.4p
- Diet-related disease 37.3p
- Imported food 7.8p
- Farm support payments 2.5p
- Regulation and research 2.7p

Total £1.00

A high proportion of these extra costs are paid by UK consumers through general and local taxation, water charges and bottled water purchases, private healthcare insurance, and lost income. Others are paid over time to mitigate longer-term impacts such as global warming, ozone depletion, soil degradation and biodiversity loss.

We have been led to believe we are spending less on food than ever before. Food prices as a proportion of income have fallen significantly. However, in reality, for every £1 we spend on food, we pay another £1 in hidden ways.

Hidden costs in 2015

**UK consumer approximate spend**

<table>
<thead>
<tr>
<th>Category</th>
<th>Spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food</td>
<td>£86.08 billion</td>
</tr>
<tr>
<td>Fruit and vegetable juices and non-alcoholic drinks</td>
<td>£8.44 billion</td>
</tr>
<tr>
<td>Catering1</td>
<td>£25.62 billion</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£120.14 billion</strong></td>
</tr>
</tbody>
</table>

**Hidden food system externality costs**

<table>
<thead>
<tr>
<th>Category</th>
<th>Spend</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural capital degradation</td>
<td>£30.93 billion</td>
</tr>
<tr>
<td>Biodiversity loss</td>
<td>£12.75 billion</td>
</tr>
<tr>
<td>Food consumption-related health costs</td>
<td>£44.91 billion</td>
</tr>
<tr>
<td>Food production-related health costs</td>
<td>£16.08 billion</td>
</tr>
<tr>
<td>Farm support payments and regulation</td>
<td>£6.36 billion</td>
</tr>
<tr>
<td>Imported food</td>
<td>£9.22 billion</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>£120.25 billion</strong></td>
</tr>
</tbody>
</table>

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a This calculation is based on the assumption that restaurants spend around 30% of their budgets on food, drinks and condiments, so it is appropriate to include 30% of the £85.4 billion spent on catering services – that is £25.6 billion - to actual ‘catering food spend’ in 2015.

b A commonly cited figure for total UK consumer food spend is £201 billion. For example, a recent paper by Professor Tim Lang and colleagues, ‘A Food Brexit: time to get real’ (2017) cites the £201 billion figure. This is based on data in the Food Statistics Pocketbook 2015 published in 2016 (which in turn relies on Consumer Trends ONS data), and includes expenditure on alcoholic drinks (£49 billion) as well as all of the catering spend (including labour, overhead costs etc. as mentioned above).

c Some of the costings in the report are based on limited data and must be seen as tentative. However, the total costs calculated are unlikely to be an over-estimate. We have not included any costs for some areas where they clearly exist because there is insufficient evidence to apportion these accurately.
Breakdown of negative UK food system externality costs in 2015

<table>
<thead>
<tr>
<th>Category</th>
<th>Cost (£ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural capital degradation</td>
<td></td>
</tr>
<tr>
<td>GHG emissions and air pollution</td>
<td>14.23</td>
</tr>
<tr>
<td>Food waste across the total UK food system</td>
<td>12</td>
</tr>
<tr>
<td>Soil degradation including soil carbon loss</td>
<td>3.21</td>
</tr>
<tr>
<td>Water costs attributable to agriculture</td>
<td>1.49</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>30.93 billion</strong></td>
</tr>
<tr>
<td>Biodiversity loss</td>
<td></td>
</tr>
<tr>
<td>Loss of ecosystem biodiversity due to agriculture</td>
<td>12.75 billion</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>12.75 billion</strong></td>
</tr>
<tr>
<td>Food consumption-related health costs</td>
<td></td>
</tr>
<tr>
<td>Cardiovascular disease, diabetes, cancer and dental caries</td>
<td>22.94 billion</td>
</tr>
<tr>
<td>Malnutrition</td>
<td>17</td>
</tr>
<tr>
<td>Overweight and obesity</td>
<td>3.97</td>
</tr>
<tr>
<td>Hypertension</td>
<td>1</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>44.91 billion</strong></td>
</tr>
<tr>
<td>Food production-related health costs</td>
<td></td>
</tr>
<tr>
<td>Antibiotic resistance</td>
<td>2.34</td>
</tr>
<tr>
<td>Food poisoning</td>
<td>1.7</td>
</tr>
<tr>
<td>Organophosphate pesticides</td>
<td>12</td>
</tr>
<tr>
<td>Colon cancer linked to nitrate in drinking water</td>
<td>43.5 million</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>16.08 billion</strong></td>
</tr>
<tr>
<td>Farm support payments &amp; regulation</td>
<td></td>
</tr>
<tr>
<td>Rural Development Programme, administration, regulation and research</td>
<td>3.35 billion</td>
</tr>
<tr>
<td>Basic Payments Scheme</td>
<td>2.95</td>
</tr>
<tr>
<td>BBSRC food and farming research</td>
<td>56.2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>6.36 billion</strong></td>
</tr>
<tr>
<td>Food imports</td>
<td></td>
</tr>
<tr>
<td>Net hidden cost of food imports</td>
<td><strong>9.22 billion</strong></td>
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</tbody>
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**Notes:**

a Lacking adequate data, we assume imported food will on average be the same as in the UK. However, we believe this figure is likely to be a significant under-estimate for three reasons; see chapter 6 of the full report.

b The cost of the environmental impacts of producing imported food and feed, less the pro-rata costs of producing food we export, which are already included within the natural capital and biodiversity costs above. We have added the hidden costs of palm oil imports to this.
The economics of our food system

The UK government has long prioritised keeping the price of food low, arguably at the expense of other social and public policy goals. The cultural assumption that ‘cheap’ means ‘good’ was enshrined in the 1947 Agriculture Act, which aspired to food production at “minimum prices”.

While it has generally been assumed that this approach benefits consumers, it has actually given rise to a distorted economic system where lowering the retail price of food as a proportion of average income has resulted in a shadow economy worth over £120 billion a year.

For well over a decade, the Treasury has issued advice to government departments via its Green Book, of “the need to take account of the wider social costs and benefits of proposals, and the need to ensure the proper use of the public resource...attributing monetary values to all impacts of any proposed policy, project or programme”. Yet, with only limited exceptions, this does not appear to have influenced Defra’s approach to food and agricultural policy, either within the European Union or at home.

Ever since the Second World War, policy attention has focused on the importance of intensification, specialisation and scale in farming, with productivity and economic efficiency cast as the ultimate metrics of success. After the serious food shortages experienced during the war, it was perhaps inevitable that this would continue and even increase in the immediate post-war period. Yet this approach has continued through periods of over-production and, if anything, increased in recent years as few meaningful constraints have been placed on support payments. Farmers have been further told that the only way to survive economically is to get bigger, increase output still further and drive down costs, so they can compete in a globalised free-trade world.

The negative impacts of this approach are well documented. They range from diet-related ill-health, food contamination and reduced quality, antimicrobial resistance, air, soil and water pollution, to soil degradation, biodiversity loss, global warming and the depletion of natural resources. The current approach to food production is not serving us well, and thrives largely because it does not account for the full costs of production.

Underpinning this is a food industry which has invested heavily in advertising, attractive packaging and the production of highly processed foods, which invariably ‘add value’ for food companies at the overall expense of society.

More than half the hidden costs identified in this report are linked to food-related ill-health.
However, while a significant proportion of these costs relate to the high levels of diet-related disease, they are not all caused by poor consumer choice, since food production, contamination and quality issues are also implicated. The costs included only relate to food. They do not include the costs linked to lack of exercise, smoking or genetic predisposition etc. While further education about healthy diets is clearly needed, it is currently impossible to breakdown the costs any further. However, it is clear that, in one way or another, consumers have little choice but to consume the foods that are produced by the current food production system, in the way in which the food industry serves them up, and that this is influenced by policy.

For example, the Basic Payment Scheme, which makes no payments to producers with less than 5 hectares, has arguably facilitated the dramatic rise in farm scale wheat and oilseed rape production, but accelerated the demise of market gardeners, the small-scale horticulturalists who were once the backbone of fresh fruit and vegetable production at a local level in the UK. In Wales, for example, barely half as much land produces fruit and vegetables today as 40 years ago and consumers are therefore more limited in their ability to make purchases direct from producers at lower costs to themselves and to the environment.

‘The Hidden Cost of UK Food’ reveals the perverse incentives that govern the UK food system, where it is more profitable to produce and distribute food in ways that pollute or degrade natural resources, than in ways that delivers genuine environmental and public health benefits. What is more, because the costs of harmful practices have been quietly borne by society, there have been relatively few incentives for improvement.

This represents a significant market failure. When externalities are not factored in, it is not possible to calculate the true price of food. This makes it is impossible for policy makers, producers and citizens to make good decisions about what and how to produce and consume, and this in turn encourages the continued production of products that have the highest hidden costs for society.

Decisive policy action is needed to correct this distortion. The government must commit to measuring the positive and negative impacts of the whole food system, and set strong policy, regulatory and fiscal frameworks for food and farming post-Brexit which take these externalities into consideration. In practice, this means taking steps to internalise the hidden costs of food, requiring producers and supply chain actors to account for the pollution, resource depletion and environmental degradation they cause, and using the savings to the public purse to introduce market and fiscal measures to encourage food production approaches which greatly reduce these hidden costs.

While this level of interventionism may constitute a new approach to UK food and farming policy, it will be crucial to creating the business case for change and enabling us to address the serious environmental and the diet-related disease problems associated with the current food system.

Our main findings

Natural capital degradation
Total £30.93 billion

Natural capital is the world’s stock of natural resources and the ecosystem services performed by them. This global cache of assets includes soil, water, air, mineral deposits, flora and fauna, fossil fuels, pesticides and antimicrobials. Natural capital performs irreplaceable functions which underpin the global economy, human well-being and food security; from climate regulation, pollination, flood defence and carbon sequestration, to the provision of food, fuel, fibre, medicine and materials.

The overuse of both finite and renewable resources - and the unsustainable appropriation of the ecosystem services they provide - is contributing to the depletion of these crucial shared assets. Modern agriculture delivers an impressive double blow in this regard. Not only are most farming systems heavily reliant on non-renewable inputs, many ‘conventional’ farming methods are also associated with the degradation of natural assets such as soils, water and biodiversity, dramatically reducing their natural resilience. If we are to halt the decline of these precious commodities, the natural environment must be incorporated into global and national accounting frameworks.
Greenhouse gas (GHG) emissions and air pollution  £14.23 billion

Net GHG emissions from UK farmland and woodland account for 8.72% of total UK emissions. The majority of agricultural emissions are linked to enteric fermentation (ruminant flatulence), nitrogen fertilisation and manure decomposition. These processes produce three main emissions; methane, nitrous oxide, carbon dioxide (CO2). Methane is UK agriculture’s major GHG, contributing 27.7 million tonnes of CO2 equivalent, mostly emitted as part of the digestive processes of ruminant animals.

Nitrous oxide (N2O) is the second largest contributor to agricultural GHG emissions in the UK. Nitrous oxide emissions predominantly arise from nitrogen fertilised soils. In 2015, agricultural soils accounted for 62% of total UK N2O emissions. Causal factors include soil degradation and the conversion of grassland to cropland, processes which add nitrous oxide and CO2 to the atmosphere. Nitrogen-enriched water and manure storage also contribute to N2O emissions.

Agriculture is also responsible for 80% of the UK’s ammonia emissions. Ammonia combines with particulate matter and oxides of nitrogen, contributing to air pollution and fuelling cardiovascular and respiratory diseases.

We base our costings for GHG emissions and air pollution from UK agriculture on a study funded by Defra and the devolved administrations, which places this at £2 billion (2006 prices.) However, we recalculate the climate change portion of this figure in line with a recent study from researchers at Stanford University who estimate that when social costs are included, a more reliable value for the social cost of carbon is $220, or £173, per tonne. This gives a total of £10.35 billion in 2015.

To this we add an estimated figure of £1.72 billion for the environmental cost of domestic food transportation. We estimate the health cost of agriculture-related GHG emissions (specifically the depletion of the ozone layer due to ozone-destroying chemicals) to be £1 billion at 2015 prices. Finally, we calculate the cost of agriculture-related ozone loss in the stratosphere to be £1.16 billion. This gives us a total figure of £14.23 billion for GHG emissions and air pollution from agriculture.

Food waste  £12 billion

Approximately 1.3 billion tonnes of food is wasted each year globally. Uneaten food is equivalent to the production of about 1.4 billion hectares of land - almost 30% of the world’s agricultural land.

The global cost of food waste has been estimated to be around $1 trillion annually. In addition to this economic cost - which includes the actual value of the products that are lost or wasted as well as the subsidies that go

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*Image: Intensive livestock farms are a source of GHG emissions and the main source of ammonia (Photo: Terry Mathews / Alamy Stock Photo)*
into producing those products - there are environmental costs of around $700 billion (due to impacts on the air, water, soil and biodiversity) and social costs of around $900 billion (due to the impact of livelihood loss, health damages, and the impact of conflict).  

A 2013 WRAP report on food waste from UK households, hospitality, food manufacture, retail and wholesale sectors estimated that 12 million tonnes of food is wasted annually in the UK. This represents an economic value of £12 billion per year, and contributed 20 million tonnes of GHG emissions. The report suggests that between 2015 and 2025 around 20 million tonnes of food waste could be prevented, saving £30-£40 billion and avoiding 60-70 million tonnes of CO2 equivalent from being generated. We use WRAP’s figure of £12 billion for the cost of food waste in the UK.

Soil degradation    £3.21 billion

Healthy soils are fundamental to the well-being of the natural environment, ecosystems and humans. Over 99% of human food calories come directly or indirectly from plants grown in the soil. Soil contains 25% of global biodiversity, and sequesters approximately 2,500 billion metric tonnes (MT) of carbon - much of this as soil organic carbon. This is essential for maintaining soil fertility, water retention, plant health and agricultural productivity - and crucially, for climate change mitigation.

Many modern agricultural and forestry practices are contributing to the structural and biological devastation of our soils. Heavy use of fertilisers, pesticides and other chemical inputs, excessive cultivation, overgrazing and monoculture are causing soil degradation and soil biodiversity loss. Soil organic matter has declined drastically, resulting in reduced soil carbon levels, loss of nutrients, increased risk of droughts and floods due to poor water-holding capacity, and greater risk of crop disease. Globally, over half of all soils are now classified as degraded or severely degraded.  

Over the last 20 years, a number of studies have analysed the negative impact of agriculture on UK soils, and attempted to quantify this in monetary terms. Approximations have risen from initial modest annual estimates of £24 million (in 1996), to the current highest published estimate of £1.33 billion (a 2015 Cranfield University study which examines soil degradation in England and Wales).

In order to ascertain the economic cost of agriculture on UK soils, we extrapolate from the Cranfield study (detailed above) to account for soil degradation costs on the 7.2 million hectares of farmland in Scotland and Northern Ireland, which increases the figure from £1.33 billion to £2.19 billion. In relation to England and Wales, the Cranfield researchers use a figure of £570 million for soil carbon loss which, adjusted to include Scotland and Northern Ireland, is equivalent to £936 million for the UK based on a social cost of carbon (SCC) of £51 per tonne of CO2. The study recognises that this estimate is sensitive to the value placed on a tonne of CO2. Applying Stanford University’s higher SCC figure of £173 tonne of CO2 gives us a total figure of £3.21 billion for soil carbon loss.
Modern agriculture is a thirsty business. The global agricultural sector uses around 70% of the world’s available freshwater. Wasteful water use by the farming sector is readily depleting freshwater supplies - inhibiting the water table’s ability to replenish itself and contributing to global water scarcity. Of the world’s 37 major aquifers, 21 have been overexploited to such an extent that they have now reached their sustainability tipping points.13

Excessive irrigation can cause substantial damage to soils and groundwater through salinization, greatly impacting agricultural production. In addition, used irrigation water is commonly contaminated with chemical pollutants such as pesticides and herbicides. Over-irrigation can wash pollutants and sediment into rivers - causing damage to freshwater ecosystems and species. Poor irrigation drainage can also cause waterlogging and increase the risk of water-borne diseases.

Water pollution by agriculture can lead to eutrophication - the over-enrichment of surface waters with nutrients, due in part to high nitrate and phosphate runoff from fertilised fields. Over 245,000 square kilometres of global marine ecosystems are now classed as ‘dead zones’.14

The most complete study we found estimates the cost of environmental damage in England and Wales from agriculture to water to be equivalent to £1.2 billion in 2015.15 In order to also account for the annual value of flood damage attributable to farming, we use Defra’s figure of £233.8 million in 2007, equivalent to around £0.29 billion in 2015.16 **This produces an overall figure of around £1.49 billion for water-related costs from agriculture.**

Increasing field size, monocultures, pesticides and fertilisers all contribute to biodiversity loss (Photo: Gary Naylor)

**Biodiversity loss**

**Total £12.75 billion**

Agricultural intensification has indisputably led to dramatic loss of biodiversity. Modern agricultural production methods have prioritised the maximisation of crop yields at the expense of natural habitats, leading to the removal of hedgerows, boundaries and other habitats, greatly impacting many wildlife species and the ecosystems services they provide. These habitat losses are causing significant disruption to the nesting and hibernation patterns of the avian population - in particular, farmland birds.17

We have lost more than 44 million breeding birds in less than half a century18, with extremely concerning implications for the vital ecosystems services they provide, such as insect pest control, pollination and seed dispersal.

In addition, the adoption of large-scale monoculture has given rise to a corresponding increase in herbicide, insecticide and fungicide use - each of which has been shown to have negative impacts on wildlife. The rise of monoculture cropping has gone hand-in-hand with the loss of species-rich pasture. It is estimated that between 1930 and 1984 97% of enclosed semi-natural grasslands were lost through intensification or conversion to arable.19

There have been no recent attempts to calculate the full cost of biodiversity loss in the UK. A 2008 study conducted for the European Commission estimated that biodiversity losses in Europe equated to €50 (£44) billion in 2000.20 Our calculations are based on the UK’s share of the annual cost of EU-15 biodiversity losses at the time of the study, and adjusted for inflation. **This gives us the figure of £12.75 billion in 2015 for biodiversity loss related to agriculture.**
Food consumption-related health costs
Total £44.91 billion

Food consumption-related ill-health is becoming a global epidemic. The productionist rationale which has contributed to public health improvements over the last four centuries by increasing access to affordable food is now undermining health and wellbeing. The emergence of the fast food culture has expedited this crisis. Obesity - barely recognised as an issue 30 years ago and then initially only a concern of the wealthy west - is spreading globally, with studies indicating that it has overtaken tobacco as the leading cause of preventable life-years lost. Diet-related health issues such as type 2 diabetes, malnutrition and hypertension are adding huge costs to the NHS.

Yet, the phrase ‘diet-related disease’, which suggests this all relates to poor dietary choices, does not entirely reflect the reality, since emerging evidence suggests that changes in food quality, which many consumers have little ability to influence, is also a factor. Some of these issues relate to food contamination by food poisoning or antibiotic-resistant bacteria, for example. However, others relate to changing food production and processing methods which affect the quality of food in more insidious ways. One example of this is that levels of long chain omega-3 fatty acids in farmed fish in the UK have halved in recent years, yet a large number of studies indicate that ensuring an adequate intake of these essential dietary components is one of the key ways to reduce the risk of developing a wide range of diet-related diseases.

The impacts of diet-related ill-health are disproportionately felt amongst groups with lower social and economic status.21 Tackling health inequalities should be a core indicator of the success of government strategies aimed at addressing wider social inequality in the UK.

Cardiovascular disease, diabetes, cancer and dental caries £22.94 billion

A 201122 study estimated that cardiovascular disease, type 2 diabetes, cancer and dental caries made up around 6% of total NHS costs in 2006/2007. Adjusted for NHS spend in 2014/2015, this equates to £8.04 billion in 2015. So as to include the wider costs to society from lost productivity and increased care (as well as direct cost to the NHS), we take figures from a further study23 which places the indirect cost at £12.9 billion, (£14.9 billion at 2015 prices). This gives us a total of £22.94 billion.

(Note that we believe this to be an under estimate for the indirect costs associated with type 2 diabetes, cardiovascular disease and the impact of diets on the incidence of certain cancers.)

Malnutrition £17 billion

In the UK, it was estimated in 2005 that more than £7.3 billion was spent on treating malnutrition annually.24 In addition, a further £5.3 billion was spent on long-term care and intensive nursing.25 Taken together these costs were £12.6 billion in 2005, equivalent to £17 billion in 2015.

(Note that a more thorough analysis is needed to ensure there is no double accounting here in relation to some costs related to type 2 diabetes, dementia and antibiotic-resistant infections.)

Overweight and obesity £3.97 billion

Our figures for overweight and obesity rely on analysis by Scarborough and colleagues in 2011,26 who estimate that overweight and obesity costs the NHS £3.03 billion, or £3.95 billion at 2015 prices. We conservatively attribute 30% of the obesity-related costs to dietary factors, which gives us a figure of £1.19 billion for the diet-related component of obesity.

To account for the cost of lost earnings directly attributable to obesity, we add a further proportional cost. This is based on existing analysis which indicates that 70% of the total cost of obesity comes from lost earnings.27 This gives us a total figure of £3.97 billion.

(Note that this figure does not include costs related to overweight, or additional costs to society related to care in the community and further welfare costs.)
Hypertension £1 billion

According to Public Health England, diseases resulting from high blood pressure are estimated to cost the NHS over £2 billion per year. Given that about half of hypertension can be attributed to unhealthy diets (high salt consumption and low dietary potassium - related to low fruit and vegetable consumption), this would mean roughly £1 billion of the total cost to the NHS in England relates to food consumption.

(Note this figure would be slightly higher if it included Scotland, Wales and Northern Ireland.)

Food production-related health costs

Total £16.08 billion

The costs to society and to individuals from food poisoning have long been recognised. While significant progress has been made in reducing the incidence of salmonella and campylobacter infections - most of which relate to chicken - these remain at very high levels.

The widespread use of antibiotics in intensive livestock production is increasingly recognised as a major concern. While less than half of all antibiotics are given to farm animals and more than half directly to humans, there are approximately twenty times more farm animals than humans and each use of an antibiotic creates the conditions where existing antibiotic resistance genes can be selected for and increased in numbers. We have estimated costs based on an estimate of the total annual cost of antibiotic resistance in the UK, plus analysis from the US which provides a rough estimate of the extent of the problem that is related to food.

A number of studies indicate that the herbicide glyphosate may increase the risk of cancers. We have not included any costs for this because the issue is hotly disputed and even if the association is correct, no one to date has estimated the potential cost of this. On the other hand, organophosphates (OPs) are included as an active ingredient in a high proportion of pesticides and can affect the nervous system and brain development in children. Some studies have estimated the possible cost to society due to the use of OPs and we base our cost estimates on these.

Placing a monetary value on health externalities is a crucial step in identifying where policy action is needed. Parallels can be drawn with public health-centred policies to curb tobacco consumption in Europe, which saw the gradual phasing out of financial subsidies for tobacco production in 2004. This was on the back of widespread recognition of smoking as a major contribution to medical costs. (In the same year, the NHS spent around £1.5bn treating smoking related diseases).

While the links between methods and types of food production, diet and human health are indisputable, the complex network of interdependencies between them makes it difficult to estimate the precise cost to society from diet-related diseases. We highlight the likely scale of these costs, as well as the research gaps that need filling in.

Organophosphate pesticides £12 billion

Pesticides cause damage to human health by direct exposure, release into the environment, and residues in food. The best estimates of the health impacts of pesticides in the UK look at exposure to agriculture-related Endocrine Disrupting Chemicals (EDCs). EDCs interfere with the hormone system and can cause developmental, reproductive, neurological and immune system problems. However, very few studies have so far been able to quantify such impacts let alone calculate their financial costs.

One area where that has been attempted, however, relates to organophosphates. Pre-natal exposure to OPs is estimated to cost between €146-195 (£128-£171) billion annually across the EU. The UK’s proportion of the average of £149.50 billion (based on 8% of the EU’s population) means that the cost to public health from organophosphate pesticide exposure in the UK could be as high as £12 billion per year.
Antibiotic resistance  £2.34 billion

Most studies suggest that the main driver of antimicrobial resistant (AMR) infections in people is the overuse of antibiotics in human medicine. However, the routine use of antibiotics to treat large groups of livestock - often for purely preventative purposes - is contributing to resistance in a number of serious human bacterial infections.

The Centers for Disease Control and Prevention in the US attributes 22% of AMR illness in humans to food. A UK study on the economic burden of AMR placed the cost to society at around £10 billion per year. Applying this cost to CDC’s figure above, places the cost of food-related AMR at up to £2.2 billion in 2012, or roughly £2.34 billion in 2015.

Food poisoning  £1.7 billion

Food poisoning is caused by ingesting bacteria such as salmonella, campylobacter, E. coli and listeria, often via contaminated food - particularly chicken. Campylobacter is the most common cause of food poisoning in the UK. About four in five cases of campylobacter poisoning in the UK come from contaminated poultry. UK Food Standards Agency figures for campylobacter indicate that it is responsible for more than 280,000 cases of food poisoning each year and an estimated 100 deaths.

In the UK, it is estimated that a million people suffer a foodborne illness each year. In 2008 this cost £1.5 billion, equivalent to around £1.7 billion in 2015, due to hospital treatment and deaths.

Colon cancer from nitrate in drinking water  £43.5 million

Around 16,000 people die from colon cancer in the UK. Studies have linked high nitrate levels in water to colon cancer, with European Nitrogen Assessment research suggesting that high nitrate levels in EU drinking water are associated with at least 3% of cases. The associated financial cost has been estimated at €1 billion per year across 11 EU countries, roughly equivalent to £43.5 million for the UK in 2015.

(Note that this calculation was based on data from the early 1990s. More research is required to examine the health risk from current levels of nitrate in drinking water, which are generally below the maximum permitted level, but frequently well about the recommended level.)
Dementia

There has been some debate around the evidence that pesticides are linked to neurodegenerative diseases, including Parkinson’s disease and Alzheimer’s. In addition, a link between diet and dementia is increasingly being made. The report examines some of the issues, but there are currently no reliable estimates of what proportion of cases can be traced to poor diets or changes in the micronutrient content of food. We are therefore unable to include costs for dementia.

Farm support payments and regulation

Total £6.36 billion

In 2014/2015, Defra had access to £6.3 billion in funding; £2.6 billion of this came directly from the Exchequer. The EU contributed £3.1 billion, mostly via the Common Agricultural Policy and Rural Development Programme. Further income of about £421 million came from fees, levies and licensing.

Food imports

Total £9.22 billion

Our calculations for the externalities associated with food imports are applied to the net value of imports for food, livestock feed and drink. Accounting for the UK’s trade gap, the value of imports was £15.8 billion in 2015. This report finds that the cost of the negative externalities linked to food production (natural capital degradation, biodiversity loss, food production-related health costs, and subsidies and regulation) in the UK is approximately 57p for every £1 spent on food. Applying this calculation to the £15.8 billion for food imports allows us to estimate the production externalities associated with food imports to be around £9.01 billion.

If we add the hidden cost of importing palm oil of roughly £210 million per year, this gives us an estimated total of £9.22 billion for the hidden cost of food imports in 2015.

Clearly, the externalities associated with different food products will vary significantly across exporting countries. The calculation above is expected to be an underestimate, as many production-related externalities in exporting countries are likely to be higher than in the UK. This applies in particular to products like soya beans and palm oil, from former rainforests where soils are prone to rapid degradation.
Challenges to be overcome

This report identifies two major challenges inhibiting the wholesale shift towards better practices:

Firstly, there is currently no business case for most food producers to adopt more sustainable practices. Most food businesses keep their own expenditure to a minimum by passing on the cost of damaging practices to consumers and the environment in hidden ways. In contrast, those who make the greatest effort to farm sustainably generally incur additional costs, and have to charge a premium for food products - thereby limiting the market for them.

Secondly, there is no commonly accepted protocol for assessing the impact of different types of damage caused by food systems. The absence of such a mechanism is a great impediment to progress. How - as per the maxim - can we manage what we cannot measure?

Creating the business case

True cost accounting, also known as full cost accounting, is a recognised way of accounting for the full costs of an activity or an industry. Applying a true cost accounting approach to the UK food system would greatly help businesses to assess the environmental and societal implications of their activities and would enable food and agricultural policy makers to make better-informed decisions.

The adoption of this approach has the potential to create a strong business case for a wider shift to more sustainable food production, processing and retailing. This is sorely lacking within the current market paradigm, which considers only the costs and benefits of food commodities once they have entered the market. Currently, businesses which pollute or overuse natural resources do not feel the full financial brunt of their activities, while more sustainable businesses generally obtain little, if any, financial remuneration for the extra costs they incur. This incentivises businesses to grow in areas where growth is least sustainable, and stifles investment in genuinely sustainable development.

The true cost approach offers a methodology for correcting this market distortion. Clearly, its success relies on strong political action to re-integrate these costs into the supply chain, and to set out clear financial imperatives for a better production system. Various fiscal measures could be brought forward to enable such a transition; including the levying of taxes on polluting inputs, redirection of subsidies, tax breaks, or more generous capital gains allowances.

Bringing about a similar transformation amongst food processors and retailers will be more challenging. Changes in farm support which make it more profitable to produce healthy foods and more expensive to produce commodity crops and grain-fed meat would help in this respect, but ultimately it will also require food industry actors to become more socially responsible.

Addressing the knowledge gap

This report attempts to help address the knowledge gap outlined above by bringing together the most up-to-date evidence which quantifies and monetises the diverse negative impacts of the UK food system.

The rationale is simple. Only when equipped with the full range of facts illustrating the extent and scope of food system externalities will it be possible to reach sound decisions about how to mitigate and manage these impacts appropriately. Without an understanding of these hidden costs, it will be extremely difficult for policy makers to develop agricultural policies which stimulate best-practice and deliver tangible public benefits. This information is equally crucial for businesses assessing the impact of their operations and for consumers evaluating their food choices.

Demonstrating externalities in economic terms provides us with a universal framework for appraising the pros and cons of the complex patchwork of interdependencies and impacts of any given system. True cost accounting can, for example, help to convince decision-makers that investing in conversion to more sustainable food systems is cheaper than current expenditures for environmental mitigation and public health. However, there are clearly many values which cannot easily be couched purely in economic terms, such as human wellbeing and aesthetic beauty. While it may never be possible to
calculate the costs of some of these more intangible externalities, and some may even see this as inappropriate, they do invariably have associated financial costs. As such, academics should be encouraged to look at the wide range of social and cultural impacts of food systems, an area which has so far received scant attention in the UK.

Conclusions and recommendations

The purpose of this report is to provide a considered estimate of how much we pay for food in ways we do not realise, much of which could be redirected to greater effect in terms of environmental sustainability, food security and human wellbeing. Its secondary purpose is to set out potential next steps for the integration of these issues into agricultural research and policy development.

While we hope this report will contribute to the overall understanding of these issues, it is limited by the lack of reliable data in a number of areas. As such, further research needs to be undertaken by academics to update existing studies and fill gaps in the data.

There are also, of course, many positive externalities provided by some food system approaches. The report summarises these, but less academic work has been undertaken on this aspect and attempting to value these is beyond its scope. Additional work to monetise those practices which deliver tangible public goods will be crucial to establishing a clear picture of the intended direction of travel for food production.

Hidden costs and their consequences

UK consumers are, in effect, paying twice for their food. As a society we are collectively spending £120.1 billion on food, and paying an additional £120.09 billion in hidden ways.

A food economy which places these externalities outside of the market passes the cost burden from the private sector to the public sector. This not only enables the continuation of damaging practices, it also keeps the retail price of food lower than it would otherwise be.

While many would celebrate low food prices on socio-economic grounds, it is widely agreed that the availability of cheap food has not addressed the root of the food poverty problem. Firstly, lowering food prices does not address the issue of food quality - one of the tripartite of factors which are commonly accepted as critical to tackling food poverty (the third factor being food access). Secondly, as we have seen, the ancillary costs of cheap food are in fact borne by consumers in multiple ways.

A further consequence of this externalisation is the entrenchment of perverse incentives within the food system. While food and farming businesses continue to operate within an economic landscape which rewards productivity over environmental husbandry, it will be difficult to shift the market paradigm. Without action to change these parameters, we risk locking-in practices which are directly antithetical to wider efforts to ensure the wellbeing of the natural environment and the species which depend on it.

Integrating true cost accounting into policy making

Policy makers and business must act on the ever-emerging body of evidence around the true cost of the UK food system, and incorporate this into decision-making.

Subsidies are perhaps the obvious place to start when considering financial incentives for more sustainable food production, particularly in the context of the UK’s expected exit from the EU. Tax measures could also be used to encourage sound farming practices, for example through use of differential capital allowances for investments in more sustainable technologies, or through income tax allowances.

As well as incentivising beneficial practices, there are a number of market and fiscal measures that could reorient the burden of responsibility and accountability, shifting the cost of unsustainable practices back to the perpetrator. A tax on over-used agricultural inputs with damaging consequences would provide revenue to the state, which could be ring-fenced to incentivise improved practices. Other economic instruments such as VAT could be used to reduce or increase retail prices of certain food products.

Post-Brexit, the UK government’s food and farming policies must ensure that the right support and incentives are in place to enable a shift away from food production, processing, distribution and retailing practices which are shown to be damaging the environment and human health. Clearly, policy coherence will be
key. Strategies to drive progress must be aligned with other public policy areas such as trade, public procurement, health and climate change. The true cost approach will need to be fully integrated into the whole food and procurement supply chain, to ensure that taxpayers’ money is not used to subsidise practices which are penalised through other market mechanisms.

Main policy recommendations for the UK Government

This report makes three major recommendations to the UK government:

1. All aspects of UK agricultural policy post-Brexit should be underpinned by an appraisal of the true costs and benefits of different food production systems and techniques.

2. Public subsidies should be redirected in a way that will discourage environmentally damaging practices, towards food systems and food types which deliver genuine public goods.

3. Consideration should be given to the use of taxes on the most damaging agricultural inputs. A key example could be the introduction of a tax on each tonne of nitrogen fertiliser, with the income raised used to compensate farmers for the additional costs involved in adopting practices proven to increase soil carbon sequestration.

A tax on nitrogen fertiliser and payments for soil carbon stewardship

Approximately 3.5 million tonnes of nitrogen fertiliser is used in the UK each year. The heavy use of nitrogen fertiliser has a number of adverse impacts, including pollution of the atmosphere and aquatic environment, the generation of ammonia emissions, and substantial biodiversity loss. The introduction of a tax on nitrogen fertiliser could be achieved at no net cost to the Treasury. In addition, this would raise revenue which could be used to encourage farmers to adopt practices known to increase soil carbon sequestration - which has the potential to deliver significant environmental and economic benefits.
Conclusion

In the course of this research, it has become clear that the hidden costs in the UK food system are significantly higher than previous composite estimates have indicated.

The price that society places on natural assets, through the money we spend on food, does not reflect their full economic value. This in turn frustrates efforts to shift agricultural practices towards a more sustainable footing, where these assets are protected, conserved or enhanced. While ostensibly keeping food costs down, omitting the true cost of food production from transactions is allowing us collectively to eschew responsibility for environmental degradation.

In the meantime, we are getting sicker, fatter, and more malnourished. The final turn of the circle sees each consumer paying twice, for both the food and the footprint. This self-harming sequence brings to mind the words of Rachel Carson: “Man is a part of nature, and his war against nature is inevitably a war against himself.”

Careful application of the true cost framework would deliver greater long-term food security at a lower cost to the public purse than the UK government’s current policy focus on maximising yields, while the costs of externalities are borne by society. It would ensure that food production does not prevent the UK from achieving sustainable development goals and meeting decarbonisation targets, while providing a clear international signal of the UK’s leadership on tackling public health challenges, environmental degradation and climate change.

Without policy action, the potential for change is left in the hands of businesses and consumers. While these actors have enabled the considerable growth of the ‘sustainable’ food market, only a small percentage of the population is willing or able to pay the price premium associated with some of these sectors - organic being a prime example. As a result, the impact of these systems is limited.

The introduction of true cost accounting into agricultural policy would provide a way of recognising the value of organic and other more sustainable approaches beyond the commodities they produce. Through the redirection of financial subsidies, farming systems and methods which deliver sustainability and public health objectives can be incentivised. Over the long term, this support should remove the requirement for the price premiums currently attached to sustainably produced food. This is important, as consumers who pay premium prices to enable more sustainable production also currently pay their share of the societal costs associated with the damaging aspects of the food system.

Internalising the hidden costs of production could result in price rises of certain food products, particularly those from intensive systems. This could be offset by concurrent reductions in the price of other foods - enabled by steps to internalise the hidden benefits of some agricultural practices, with farmers rewarded for the associated positive externalities. Redirection of existing agricultural support should achieve some objectives without any significant increase in overall food prices. However, the government must ensure that low income social groups are protected from price rises by investing in policies to tackle food poverty and to improve access to good quality food.

It needs to be remembered that the price farmers receive for their crops makes up only a small proportion of the retail price. Typically, wheat leaving a farm at well below 20p a kilo retails as flour at £1.50 a kilo, and accounts for less to 10p of the price of a loaf of bread. As such even a 25% increase in the price of wheat would only add 2.5p to the cost of a loaf.

OECD data shows that obesity-promoting foods currently attract the most investment - particularly long shelf-life, high added-value, highly branded confectionery, baked goods and soft drinks. However, a new trend amongst food investors is emerging, with these actors increasingly making investments in healthy and sustainably produced foods.

At the heart of this debate is the question of what and how we value, when it comes to the food we eat. If society is to protect its assets, urgent steps must be taken to formulate national and international strategies which bring these issues to the heart of decision-making and integrate them into all other areas of public policy. Our view is that only by being honest about the true cost of food do we have any chance of addressing the huge food-system-related problems that face us.

We challenge the UK government to lead the way.

Download the full report: sustainablefoodtrust.org/key-issues/true-cost-accounting
REFERENCES

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The Sustainable Food Trust is a UK based charity working internationally to accelerate the transition to more sustainable food systems.

We believe radical changes are needed to address the problems of farm-related environmental degradation and biodiversity loss, food security and diet-related disease, but this will only be possible when leaders and organisations are empowered to act through a combination of sound evidence and enabling policy measures, supported by pressure from informed public opinion.

We are committed to facilitating a transition away from the current industrialised food model, to food systems which are more diverse and integrated, minimise depletion of natural resources, and promote public health, social justice and human wellbeing.

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