feeding Britain – what consumers want

Edited by Nick Johnson
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Foreword
Nick Johnson, Research Fellow at the Smith Institute

Food is an often misunderstood area of public policy, and yet it accounts for 10% of household expenditure and is linked to 12% of employment, 70% of land use and 20% of energy use in the UK. Furthermore, it is an area where demand seems to be firmly in the lead against supply, with issues such as price, quality, availability and access affecting the supply chain. In this collection of essays, the Smith Institute aims to explore some of the policy implications of changes in the way people view and consume food and what this means for government, suppliers and the commercial sector.

Last year, in association with the Agriculture & Horticulture Development Board, we published a collection of essays about food production and security. Alongside this, we hosted a seminar involving politicians and experts. This led to a series of fringe events at the party conferences, kindly supported by Wm Morrison Supermarkets. The range of issues discussed and raised by audiences prompted the suggestion that there was at least another collection of essays to be commissioned. Our initial work focused on the supply side of the food industry and addressed such issues as the impact of climate change on food production, the use of research and technology and the question of self-sufficiency.

As this project has developed, we have chosen to focus on the demand side of the food industry and on some of the more social and consumer aspects of food. In this publication, we explore some of the issues around consumer behaviour and the role of food and food suppliers in the community. We examine what we mean when we talk of a healthy sustainable diet and the implications that this has for both consumers and producers. In particular, the contributors explore the relationship between health, affordability and sustainability.

We are grateful to have such experts contributing to our work and have sought to get the leaders in their fields to address such issues as food labelling, the ethics of food and nutritional standards. As you would expect, there are some disagreements among the contributors, notably about the relationship between sustainability and technology, on which consumers’ current preferences are not always in tune with suppliers’ needs.

Our aim is to look at the policy and practical implications of food issues. Food seems to be everywhere in our popular culture – from celebrity chefs on TV to recipe books in shops and food festivals all over the country. It is also in our newspapers and on our radios – whether this is the debates over genetically modified food, the organic movement or the argument that our carnivorous diet contributes to climate change. Yet what does all this mean?
In this collection of essays, we have been supported, though not directed, by Wm Morrison Supermarkets. Its new chief executive, Dalton Phillips, contributes his thoughts on the challenge for supermarkets in identifying how to combine their desire to be a responsible business with meeting customers’ demands. We hear people saying that they value local suppliers, strong animal welfare practices and organic production methods. And yet they are often unwilling to pay the price that these may demand and seem ultimately to be motivated by perceptions of value. Our current straitened financial times are likely to exacerbate this. Indeed, reconciling the sometimes contradictory views of the public on these issues is a theme that recurs throughout the collection.

We hope that these essays and the discussion that follows are not only enlightening but also lead people to consider their approaches to these issues. We are grateful to all the authors for their contributions and to Wm Morrison Supermarkets for their support for this publication and the associated seminar.
What do people want from food?

Dalton Philips, Chief Executive of Wm Morrison Supermarkets
What do people want from food?

Food retailing in Britain delivers wide choice to shoppers as well as great value for money. Over the past 20 years people have benefited from an ever-increasing range of quality food at prices that have fallen in real terms. At the same time, the expectations of consumers have changed. In part this is a result of lifestyle. Many households feel increasingly time-poor, with two people working. This can mean fewer hours spent in the home, as a result of factors such as of longer-distance commuting to work, leading people to believe they have time only for instant food. As people get busier, their confidence in and knowledge of how to prepare food begins to diminish. Yet people want more from their food. They rightly expect to be able to have a healthy diet and be assured that the food they are buying has been sourced sustainably.

It is therefore understandable that when the previous government set out its food strategy in January of this year, the first element of its vision for what it wanted by 2030 was that “consumers are informed, and can choose and afford healthy, sustainable food”.

The new coalition government has not yet said how it will take forward the vision set out in Food 2030. It should take its time. It will have its own ideas for how the strategy should be delivered. But my hope is that it will keep this overarching vision of what the UK needs to achieve. The choice and affordability of food, rightly going hand in hand with health and sustainability, and all backed by good, clear information, is so fundamental that it should remain the number one priority for government. Food retailers will then be able to play their part to help people improve their knowledge and give them the confidence that they do have the time and can afford to eat well. This is what people want from food.

Why the affordability of fresh food matters

At Morrisons, we think access to affordable fresh food should be a right, not a privilege. It should not just be the better off who can enjoy a healthy diet. Everyone should be able to buy high-quality, fresh food and eat well.

And people can do that today. Walk into any one of our stores and you can purchase fresh meat, fresh fish and fresh produce to make nutritiously balanced meals for less than £1 per person. No one should feel economically excluded from getting their five a day, enjoying a wide range of cuts of British meat or benefiting from the high levels of omega 3 oils in fresh fish.

1 Department for Environment, Food & Rural Affairs Food 2030: How We Get There (2010), p7
The view too often implied that poorer people cannot afford to eat well is, quite simply, wrong. They can today. But that could be about to change.

We have already begun to see the problems associated with food security and affordability. They began well before the economic downturn. While I was working in Canada, I saw the price of basic food such as rice rise dramatically. I remember the price of wheat doubling between February 2007 and February 2008, hitting a record high of US$10 a bushel. When such commodities rise so fast, this understandably causes extreme concern for people across the world, even provoking riots, as those on the smallest incomes get disproportionately hit. Here in the UK, it has already meant increasingly volatile prices of meat. My view is that in the long run these commodity prices are likely to become even more volatile.

For now, as the world’s economies have struggled with the credit crunch, food price inflation has receded. But this may be only temporary. In the UK people are understandably concerned about the risk of unemployment. Others have had problems with credit availability. The emergency Budget in June confirmed tax rises, including VAT at 20% from next year, with very large public spending cuts expected in October. These will all affect consumer confidence and behaviour. So the only really good news for consumers at the moment is that food price inflation is very low.

But as the green shoots of recovery emerge, the affordability of food is likely to become an issue again. In 2007, the average household allocated 9.2% of its weekly expenditure to food. In the 1960s this figure was around 20%.² My fear is that the graph below, showing a near linear year-on-year decline, is beginning to go in the other direction.

This will mean people have less disposable income to spend in other parts of the economy. People will also feel that they have less money to be able to cook from scratch because they perceive it to be more expensive. And of course the poorest are always hit the hardest. Let’s not forget that in the UK, the poorest 10% of the population spend 15% of their household income on food, compared with 7% spent by the richest 10%.³

² Department for Environment, Food & Rural Affairs Ensuring the UK’s Food Security in a Changing World, discussion paper (2008), p18
³ Ibid
I think the enduring result of the economic downturn is that food shoppers, rich and poor, will continue to be more value-conscious. The experience of the past few years is that price matters to the majority of food consumers in the UK. Of course, shoppers will pay extra for special treats – as the proliferation of premium brands shows. However, at present some seven out of 10 grocery shoppers in the UK say they have become more concerned about whether they are getting value for money from their grocery purchases.\footnote{Datamonitor}

And of course the concept of value is not just about price. For all of us, the simple equation is:

\[
\text{Value} = \text{quality} \times \text{price}
\]

People increasingly want high-quality food from suppliers that they trust. They want to pay a reasonable price. They also want to know that the supplier, and in particular the farmer, has been paid a reasonable price. An increasingly large number of shoppers are not prepared to accept poor-quality food just because it is cheap. When food is cheap they worry that standards of production, such as on animal welfare, may have been compromised.

So the challenge to food retailers is how to offer customers good-quality fresh food at prices they can afford. How can we ensure that farmers are able to keep producing high-quality food and receive a fair price for their produce; at the same time how can we shield...
our customers from volatility in global commodity prices? I hope these too are challenges that the new government understands and accepts, not least the importance of ensuring choice and affordability.

**Choice and affordability**

Key to the affordability of food is choice. Supermarkets offer wide choice in order not only to meet customers’ expectations but also to drive competition. This encourages innovation to help ensure excellent quality as well as to keep prices down.

Choice means food retailers working hard to source the best deal for customers. Again, the same simple equation of offering the best value by maximising quality at affordable prices applies. When it comes to fresh food, this can mean sourcing very locally to a store, sourcing from across Britain, or looking elsewhere in the world.

We asked our customers how concerned they are about where their food comes from. The clear answer is that our fresh food should, where possible, come from across Britain rather than that it must be sourced less than 30 miles away from where they live. We agree. Why?

By sourcing from across Britain, we gain economies of scale that deliver excellent value for money. One of the reasons I wanted to work in Britain is that it is the world leader in food retailing. Britain is a nation of shopkeepers. In part, this success is because we are a relatively small island with a large population. Food retailers have been able to develop businesses that can work with British farmers to source fresh food at affordable prices.

For Morrisons, that means we sell 100% British fresh beef, lamb, pork and chicken. We are the only supermarket to do this. In effect, we are choice editing for our customers, for instance by not offering fresh Australian beef. But we do this for a reason: we think it is the best way to support the long-term viability of British farming. It is also the best way to maximise quality and affordability – even when the price we pay to the farmer is higher, as when earlier this year British lamb was some 60p per kilogram more expensive than New Zealand lamb. And we can do it because, uniquely, we own and operate the supply chain from the farm gate. In effect, we cut out the middleman from the supply chain.

We buy whole animals direct from farms and process them at our own abattoirs. The meat is sent direct to store for cutting by our own butchers. This shorter supply chain is good for freshness and affordability.

It can also make sense to source locally, particularly for fresh produce. We do this as a complement to the Britain-wide fruit and vegetables that we source, grade and pack.
ourselves. Locally sourced produce delivers excellent quality to customers, but it can also be more expensive. The same is true of organic produce. Most of our shoppers tell us they do not want to know the specific farm from which their food is sourced. But they do need to trust us that we have a close relationship with the farmers. For the majority of budget-conscious shoppers, this assurance of quality must not lead to higher prices. As I have said, it is our job to bust the myth that only the wealthy can eat well. At the same time, we need to ensure that British farmers get a fair deal to keep them supplying excellent-quality meat, produce, milk and cheese for many years to come.

Increasingly we recognise that the farm gate could, metaphorically, be a barrier. The farm gate divides our supply chain in half. Put simply, the farmer knows best how to produce food; we know best how to process it and sell it. But ultimately we both have the same customer – the British consumer. And that shopper expects the same quality meat today and tomorrow. Sir Ken Morrison has told me you can sell anything once; it is ensuring the customer comes back to buy again and again that matters.

**Morrisons’ farm programme**

So we are looking to see if we can work with farmers to learn together how we can deliver better for the customer. Our farm programme began formally in 2009, when we took the decision to invest in a series of projects with the aim of helping secure the long-term viability of British farming.

For example, in the case of red meat, we are now providing data to our beef farmers so that they can benchmark the quality of the beef they produce against that of other farmers. This enables them to share best practice to help manage the feed to the cattle in their suckler herd, to meet our specification. But we can also look together at the cuts of meat that customers are buying. If we can maximise the yields – for example, by selling pig cheeks and trotters as well as pork loin – the farmer gains more value from the pigs reared.

This is not about telling farmers what they should do. They remain the farmers; we remain the retailer. But we can work together better to meet the quality and affordability expectations of the customer.

And of course our customers expect a range of fresh food all year round. We cannot source all that we need from Britain. We cannot and should not expect to be self-sufficient. An analysis paper on food security from the UK environment department in 2006 included the surprising statistic that the UK’s self-sufficiency was the same today as it was in the 1870s,
with 60% of food domestically produced.\textsuperscript{5} It was even higher during the 1980s, when the European Common Agricultural Policy focused on boosting production, and was below 50% in the 1950s as Britain recovered from the war. Such fluctuation in response to conditions, preferably market-led, is right. The fact that the UK is currently 60% self-sufficient is a sign of the good health of our food chain: a strong domestic base, complemented by international trade, gives us diversity of range and competitiveness on price.

This means that, for example, customers expect us to ship bananas from the Caribbean or fly green beans in the hold of passenger jets from East Africa. We will continue to stock strawberries when they are out of season in Britain because the prefix “super” in “supermarket” means our customers want this choice. Asparagus from Peru is not necessarily a bad thing if it is providing fresh, good-quality food for consumers on tight budgets as well as vital income opportunities for communities in a developing country.

The coalition states in its programme for government that it “believes that much more needs to be done to support the farming industry, protect biodiversity and encourage sustainable food production.”\textsuperscript{6} We agree. But we hope they will not lose sight of choice and affordability as well.

**Health and sustainability**

If choice and affordability are the driver to price in our value equation, then health and sustainability are the driver for quality. However much individual genetic susceptibility to disease may affect our health, what we eat is the most important factor after tobacco consumption. If this is the case, then as food retailers we have a responsibility to ensure that we enable people to eat well.

Our customers tell us that the key to them eating healthily is fresh food. That is why we put so much effort into making food direct from farms affordable. But good food also needs to be accessible. This means a choice of frozen vegetables and fruit as well as staples such as pasta, all of which are part of a healthy diet. To cook fresh food from scratch requires some knowledge and some confidence. One in four of customers surveyed admit that they would cook more if they had more confidence. On average, each of us knows and cooks regularly only five meal recipes. Likewise, nearly half of us would cook more if we had more time, suggesting that we are still looking to better our cooking skills. As food retailers, we need to do all that we can to educate people on how to cook in the most cost-effective and time-efficient manner. “Ready meals” will continue to have a place, but there is more we can do to help people cook from scratch food that is healthy and affordable.

\textsuperscript{5} Department for Environment, Food & Rural Affairs *Food Security & the UK: An Evidence & Analysis Paper* (2006), p22
\textsuperscript{6} The Coalition: *Our Programme for Government* (2010), p17
One way to improve confidence in scratch cooking is to have the opportunity to ask a specialist. This requires an investment in expertise in store to provide customers with what they want. For example, we know that customers are demanding more and different cuts of meat, driven partly by prudence and partly by fashion. We can only deliver if we have skilled butchers in store, and if they can offer some advice on how to cook these cuts. Beef skirt, for example, can be part of a healthy family meal, but it helps if the customer can be advised to cook it “low and slow”. When people visit our fresh fish counter, they want skilled craftsmen to prepare it to their specification so they can cook it easily. That is why we prepare more food and employ more specialist butchers and fishmongers in-store than our competitors do.

My experience of shoppers across the world is that, when it comes to health, they are increasingly concerned about fat, sugar and salt levels in their food. Significant progress has been made across the food industry in recent years to reformulate prepared foods in step with customers’ expectations for healthy food, but also in step with people’s changing palates. Given that the penetration of own-label products is high in the UK, at some 40% of the market, supermarkets can lead the way on this. For example, a standard bag of Morrisons own-label crisps now provides only 1g of saturated fat (5% of the guideline daily amount), compared with our previous products, which provided up to 20% of the guideline daily amount. We have also reduced salt in line with the Food Standards Agency’s targets and have met the 2010 targets in 95% of categories, including those foods that are key contributors to dietary salt intake, such as breakfast cereals, bread, pizza and ready meals.

The challenge is to do this consistently with people’s changing palates so they can enjoy all the food they prepare in the home, from scratch or from pre-prepared products, and feel they are having as good an experience as when consuming food outside the home. People can and should be able to enjoy a lasagne at a restaurant which may be very high in fat and salt. But they may find that they do not enjoy a prepared meal from store or their own scratch cooking in the same way, because the fat and salt content is lower. One way forward is clear information to the customer (see below).

On sustainability, our customers are increasingly concerned about a wide range of issues, from how we reduce our plastic bag usage to reducing our carbon footprint. Overall, when we asked shoppers what makes a responsible and ethical retailer, the vast majority stated “charging fair prices” was their priority; half cited taking green issues seriously; and a third said retailers should do their bit to reduce waste and packaging as well as making it easy for consumers to do their bit for the environment.
The conclusion I draw from this research is that consumers have growing expectations that supermarkets should act sustainably, but not at the expense of rising prices. Many people expect us to do the right thing on their behalf, but cannot make the sacrifices necessary now to pay for it. In my view, food retailers therefore need to concentrate on sustainability initiatives that make sense environmentally and economically. That is why we have been able to remove over 240,000 tonnes of carbon since 2005, despite significant growth in our business, by introducing new refrigeration systems and employee awareness campaigns on reducing energy use. And that is why we have reduced our own-brand packaging by over 17,000 tonnes since 2006.

Clear information for consumers
Choice and affordability, health and sustainability must all be backed by clear information for the customer. Much of the information on choice and affordability is mandatory. For example, trading and advertising standards authorities regulate supermarkets closely to make sure our prices are accurate. On health and sustainability, on-pack labelling can play a part, but it must be meaningful.

The priority for the coalition government is to “introduce honesty in food labelling so that consumers can be confident about where their food comes from and its environmental impact”. In practice, this could mean country of origin labelling on food packaging, and potentially carbon footprint labelling as well.

I think country of origin should be clearly displayed on packs. It is fundamental to supporting choice and affordability. That is why, at Morrisons, all our products with more than 10% meat content are labelled to show where the animal was reared and the meat processed. So if it is bacon from British pigs cured at our own abattoir in Spalding, customers can see and understand that it is truly British. If it is bacon from Denmark, it will say so. They can compare clearly the product and any price differential.

I am more sceptical about carbon labelling. I salute the progress made by food manufacturers and retailers to evaluate the life-cycle carbon impact of products, but I am not sure such information should go on the pack, for two reasons. First, I am not convinced that it will help customers make choices between products. If the bacon packs I cited above had a carbon label as well as nutrition and origin labelling, in addition to the price, customers might have too much information and be confused.
Second, carbon is just one element of the environmental impact that affects sustainability of the product. Will we need to have labels for the amount of embedded water as well? Overall, most customers expect us to limit these impacts on their behalf; and we communicate to them in many different ways other than just on the pack.

So what do people want from food?
What do shoppers want from food retailers? Well, the experience of the past few years is that they want more for less. Price does not always trump other concerns. Morrisons believes that our customers want a concept of value that is a function of both price and quality. Our aim is therefore to provide high-quality food at affordable prices. Customers understand that we can control quality by being closer to source, focusing on freshness and on skilled production of fresh food from the farm gate to our stores.

Customers believe they are getting value for money if they know that their fresh meat and produce are sourced from British farmers. An increasing number of people also want skilled food craftsmen and craftswomen who can help them with the right cut of meat or fish and advise them on how to cook it. They want help with eating more healthily. That means reducing fat, salt and sugar and making fresh fruit and vegetables more affordable.

In the future it seems likely that sourcing affordable fresh food will become increasingly difficult. So our target at Morrisons – and we hope it is one that the government shares – is to continue to ensure that fresh food is affordable for all. This could be a key indicator of the success of the “big society” that the government is creating.
Chapter 2

The price of food

Lord Whitty, Chair of Consumer Focus
The price of food

My thesis in this article is that as much attention – indeed more – needs to be paid to the long-term prospect of higher food prices as is paid to higher energy prices. I also assert that, in that context, urgent recognition needs to be given to the social and environmental downsides of the totality of our present system – for food as with energy.

In energy policy, government objectives have been set for:

- eliminating fuel poverty;
- establishing energy security;
- drastically reducing greenhouse gas emissions;
- promoting energy efficiency; and
- driving technological change.

It is true that the policies to achieve these aims in energy have been woefully inadequate, but at least we have started nationally and internationally to give priority to energy policy. We have only just begun to recognise the issues on food. Hilary Benn at the Department for Environment, Food & Rural Affairs made a start with *Food 2030: How We Get There*.\(^1\)

We need to go much further.

The commentariat are claiming that the era of cheap food in developed countries is now coming to an end. It is certainly true that the real price of food in the West has – with one or two blips – been low since the 1950s, in that the rate of inflation of food prices has generally been lower than average inflation (as with energy since the 1970s). There have been a number of reasons for this, including the following:

- There has been a significant increase in agricultural productivity globally, especially with the “green revolution” of the 1970s. This is due partly to technology, partly to more land being brought into commercial production, and partly to more effective farming methods – not necessarily the same as more intensive methods.

- Primary producers in the West – especially the US, the EU and Japan – have for most of that period been heavily subsidised in various ways.

- Notwithstanding subsidies in Western (and some developing) countries, the old trade restrictions have reduced significantly, with the result that instead of the old

\(^1\) Department for Environment, Food & Rural Affairs *Food 2030: How We Get There* (2010)
commodity agreements and cartels we have large international processors and retailers dominating global demand.

- There has been a distinct improvement in the economic efficiency of the internal logistics of the food chain – largely driven in the UK (and some other countries) by the major supermarkets.

The reasons for the blips during which food prices have risen above the low trend line have usually been due to failed harvests or to heavy energy price rises. That was true even of the previous rise in 2007/08, following successive grain harvest failures in Australia and rises in the oil price. This may have been marginally aggravated by the increased demand for (land for) biofuels.

In any case, with the subsequent fall of the oil price and better harvests in Australia, Ukraine and central Asia, it appeared for a few months that we were back to lower prices.

It is also true that in the UK food prices now appear to be rising again quite rapidly, with supermarket prices in the UK up 9.5% in a year. But – although this partly reflects exchange rates – this time the commentators are expressing fears that this could be a longer-term trend. As with the rise in energy prices, forecasters may or may not be right in the short term but they are likely to be right in the medium term: there is an end in sight for the era of relatively cheap food prices in the West.

Of course in pure supply and demand costs, there have been many earlier scares and Malthus has been disproved time and again. But we now have the prospect of a global population of nine billion and have already almost reached the limits of cultivatable land – and face huge environmental and social costs to bring in higher production. Moreover, on the demand side, the increasing affluence of the Chinese, Indian and Latin American middle classes and their rising demand are creating a market that is easier to serve than the West’s demand for cheap imports, which has been the imperial and post-imperial basis for relatively cheap food.

Changes in Western subsidy regimes have also reduced previous oversupply from domestic agriculture, with its downward effect on prices (the Common Agricultural Policy single farm payment now, in effect, largely subsidises farmers’ fixed costs, rather than their marginal costs – it is, in the main, not linked to current production).
Social costs of the food chain
Of course, there were always significant downsides to this period of low food prices. In the UK in particular, the past few decades coincided with a decline since the 1950s in the nutritional value of the food we eat – particularly for the poorest and particularly for children. It was always the case that the poorest not only spent a higher proportion of their income on food (even now the lowest-decile households spend 17% of income on food, compared with 7% for the highest deciles) but also got lower value pound for pound.

That is true in total. It is also largely true in particular. When Consumer Focus's predecessor organisation, the National Consumer Council, did a survey of supermarkets, we found that most "economy range" offers in supermarkets had significantly lower nutritional value, pound for pound (both sterling and avoirdupois) than the branded ranges. (This was not universal but was largely true.)2 The concern over a national obesity epidemic reflects this decline in diet as well as less physical exercise – and it disproportionately affects the poor.

Of course there are a number of reasons for this. All consumers look not just at price but also at quality, access and convenience. The dominance of supermarkets – many of which are located so as to be accessible only by car – has limited poor communities' access to food, particularly in the food deserts of the outer suburbs of some of our major cities.

For the working poor – especially those with children – time is a major constraint; convenience food in burger bars, takeaways with high fat and salt content and snacking on sweets and crisps have replaced proper meals for many, as they have for many more affluent but time-poor families.

Supermarkets offer wider choice, but the colossal advertising spend by them and by the manufacturers of less nutritious snacks and ready meals – indeed, the very layout of stores and the promotional offers they make, with fizzy drinks, savoury snacks, biscuits and sweets dominating the BOGOF (buy one get one free) offers – has far outweighed the valiant but small-scale campaigns by Jamie Oliver on school meals and the government's “five a day”. The latest figures show that after nearly 10 years of the five-a-day campaign, average daily consumption of fruit and vegetables is still only 3.7 – 3.5 for poorer families – whereas countries such as Sweden are closer to the target.

The reality is that although most people know what a healthier diet is, in broad terms, they mostly do not pursue it (about 80% appear to know, but only just over 20% have a truly nutritionally balanced diet). This in large part is due to price, time, convenience, and lack

of clear information to consumers. And it has a seriously detrimental effect on our health and on the costs of the NHS.

Meanwhile powerful elements of the food chain continue to resist effective labelling of products to guide consumers to choose healthier diets and avoid products containing excessive fat and salt, however attractively packaged and promoted. It is to be hoped we are now seeing some progress on this front in the EU.

There is also a global dimension to this regressive social cost. As Western consumers pay £1.70 for a double espresso, do we question how much – even in a “right on” outfit like Starbucks – gets back to the coffee producer? The answer is: a much smaller proportion than was the case under the old commodity agreements denounced as iniquitous by the free traders. Even in England, how much of the 42p for a litre of milk sold by Waitrose gets back to the Dorset dairy farmer? Usually less than half. Agricultural producers are the least of the beneficiaries from our highly efficient organisation of the food chain. And at almost all stages of the chain, from the West African farmers to the migrant workers in Lincolnshire, to the food packers and shop workers at the supermarket till and in the catering trade, the food chain treats its workers to low pay and poor conditions in comparison with most industries and services.

So the full social cost has not been included in our prices, and our pricing structure has had regressive social effects.

**Environmental costs of the food chain**

The same is even truer of the environmental costs. The global food chain is the biggest emitter of greenhouse gases – particularly methane and carbon dioxide. The changing supply and demand patterns aggravate this, by maximising both intensive farming (with a high carbon-based energy take) on the one hand, and on the other extensive livestock farming – with both high methane emissions and, for example, reduction of rainforest cover. Methane contributes 20 times the greenhouse gas impact of carbon dioxide, yet little is being done to reduce the effects of the livestock industry.

Agriculture can also have other detrimental environmental effects on land use, reduction of virgin forest and other carbon-absorbing forms of vegetation. And agriculture can also be responsible for pollution of soil, air and particularly ever-scarcer water, through excessive use of pesticides and fertiliser. These latter problems at least are being tackled in Western countries through tighter regulation and more
scientifically targeted application by farmers, but their full cost is not reflected down the food chain.

It is not just farmers but the whole of the food chain that is responsible for greenhouse gas emissions. In the UK, agriculture itself is responsible for only a third of food chain emissions. Carbon-based energy is expended on refrigeration, heating and transport, and in addition there are high energy process costs occurring all down the chain.

**Table 1: UK food chain greenhouse gas emissions**

*_Metric tonnes of carbon equivalent*_

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</tbody>
</table>


Another environmental cost of the food chain is waste. Just as the energy generation and distribution grids lose energy, so does the food chain waste food; in the home, the equivalent is seeing uninsulated buildings and inefficient appliances wasting energy while fads, inefficient cooking and over-zealous interpretation of sell-by dates lead us to throw away edible food. And both in processing and distribution and in the home, the food chain wastes substantial amounts of water – which, in turn, uses substantial carbon-based energy. According to waste-reduction organisation WRAP, every tonne of food wasted has the potential to save 4.2 tonnes of carbon dioxide equivalent.

There is some hope. When I was minister at the environment department a few years ago, it was difficult to persuade the major processors and retailers to take these environmental issues seriously – but we persisted, and now both the manufacturers in the Food & Drink Federation and the British Retail Consortium have targets for reductions in greenhouse gas emissions, water use and waste reduction. That is a major step forward, but not yet enough.
Table 2: UK food chain waste

<table>
<thead>
<tr>
<th>Metric tonnes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Households</td>
</tr>
<tr>
<td>Manufacturers</td>
</tr>
<tr>
<td>Food service and catering</td>
</tr>
<tr>
<td>Retailers</td>
</tr>
<tr>
<td>Agriculture and other</td>
</tr>
</tbody>
</table>


There is some hope. When I was minister at the environment department a few years ago, it was difficult to persuade the major processors and retailers to take these environmental issues seriously – but we persisted, and now both the manufacturers in the Food & Drink Federation and the British Retail Consortium have targets for reductions in greenhouse gas emissions, water use and waste reduction. That is a major step forward, but not yet enough.

Waste reduction in the home is an area that has not improved, yet it is estimated that two-thirds of household waste of food is avoidable. Some of our propensity to throw away is due to lack of understanding of date marking – which is confusing, with its plethora of labels: “display till”, “sell by”, “best before”, “do not use after”... Some consumer education is needed here.

Consumers could also play their part if industry and regulators could come up with a comprehensible system of labelling of the carbon content of products. Much attention has been paid to air miles as an analogue for carbon content, but that can be simplistic and misleading. It is less carbon-intensive to import Spanish tomatoes and transport them to the UK than to grow them here out of season in energy-intensive glasshouses or polytunnels. The same is true for airlifting Kenyan flowers.

Other products are more marginal, however, and we need to get a clear and accepted methodology for measuring life-cycle carbon content of products in our shops – if possible, taking also into account the carbon energy effect of cooking them at home. This is a complicated issue, and the worst thing would be if carbon labelling fell into the same kind of prolonged wrangle we have seen over nutrition labelling. It is in all our interests to get an agreed system in place, probably at EU level.
Can technology square the circle?
This chapter may appear to have contradictory themes. I assert on the one hand that the cost of food is too great and too regressive both to the final consumer and to the poorer producer and deliverer, and on the other that the price of food does not fully reflect its externalities in terms of social and environmental costs. And, moreover, that those costs and hence prices are likely to increase over the medium to long term, thus aggravating the problem.

I am drawing analogies with energy; in energy it is often presumed that we can square the circle through technology – electric cars or nuclear power or windmills, it is claimed, can allow us to preserve (more or less) our way of life. And it is true that by decarbonising electricity generation and creating more efficient appliances to reduce demand we can make progress. But the reality is that it will also require dramatic corporate and individual behavioural change to meet our carbon targets.

What is the equivalent in food? Of course for many the technological fix is simple – genetic modification.

Personally I am instinctively hostile to GM; in that, I reflect the general antipathy of British and European consumers. The crass behaviour of Monsanto in the 1990s destroyed all confidence in the technology. Although there is now widespread GM cultivation in many parts of the world, and we are on to third-generation GM seeds, the fears about GM impacts on conventional and organic crops, wildlife and its economic effects on farming in the developing world have not been fully answered.

Although the heat has partly gone out of the issue in public debate, I understand that surveys on behalf of environmental NGOs as well as market research by major retailers still record strong consumer antipathy. However, the need to square the circle, meet the environmental costs and feed the world must cause all of us to think again.

Even so, I am not convinced. In any case, just as nuclear power (which I support) is not alone the solution to the energy conundrums, neither is GM the only – or indeed the major – solution to the food issues. Huge technological and behavioural changes on the part of consumers and corporates can be made that will reduce unnecessary demand, meet new demand and reduce environmental costs, without widespread adoption of GM.

Elimination of waste, more scientific farming and harvesting methods, conservation of water, reduction of energy-intensive transportation, plant improvement
programmes short of genetic modification, controls to reduce advertising of harmful foods, identification and elimination of food deserts, redressing of the balance between retailers and producers – all of these can help to address the problems of cost, supply, environmental damage and social and global inequity.

There is no one solution. Nevertheless, I recognise that the debate on GM will return. I only learned decades after his death that in the 1930s my own grandfather, a gardener by trade, invented the first viable long-season lettuce. No doubt that was frowned on in its time by purists – but I somehow still hope that his process of intensive hybridisation (which was writ large in the green revolution of the 1960s and 1970s) will prove a better solution than GM. However, there needs to be a heated debate; the future of the planet may depend on it.
Chapter 3

What is a healthy diet for the UK?

Professor Judith Buttriss, Director General of the British Nutrition Foundation
What is a healthy diet for the UK?

People have become more conscious of the relationship between food and their health: a trend no doubt fuelled by extensive media coverage. For some time, there has been awareness of the links between poor nutrition and chronic illnesses such as heart disease and cancer; more recently, the so-called “obesity epidemic” has taken centre stage.

The prevalence of obesity – which increases the risk of developing type 2 diabetes, cardiovascular disease and some cancers – has more than doubled in the past 25 years. Obesity is also associated with a range of other problems, such as reduced fertility in women, increased risks during pregnancy and osteoarthritis, to name but a few. Almost one in four British adults are now obese, and in total around two-thirds of us are heavier than we should be for our height.

Estimates from the Foresight report predict that, if these trends are left unchecked, 40% of the population will be obese by 2025 and 60% by 2050, being driven by the well-recognised trends in childhood obesity. Not only are more children obese these days, but also the rate of increase has been rising. In 2008, 17% of boys and 15% of girls aged 2-15 were obese, compared with 11% and 12% respectively in 1995, and many more are overweight.

There are marked social class differences in obesity prevalence in women, but not in men. Among women in manual households, the prevalence of obesity is 28%, compared with 19% in non-manual households (the respective percentages for overweight are 33% and 32%).

As with obesity, the prevalence of type 2 diabetes is increasing; it is thought to affect over 2.6 million people in the UK. Also, as with obesity, there are socioeconomic differences in prevalence, type 2 diabetes being two to three times more common in the lowest versus the highest income quintiles. There are also variations in prevalence among ethnic groups in the UK, with the highest prevalence of type 2 diabetes being seen in men and women

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3 Zaninotto, P, Wardle, H, Stamatakis, E et al Forecasting Obesity to 2010 (Department of Health, 2006)
whose antecedents are from India, Bangladesh and Pakistan. Although not the only factors, diet, increased physical activity and weight control are key to the prevention of both obesity and type 2 diabetes.

Is there evidence that health drives consumer choice?
Research from the Food Standards Agency published in early 2009 indicates that the most common considerations when buying food to eat at home are: eating food that is healthy (60%) and value for money (55%). The quality of the food was considered to be far less important (1%). For food consumed outside the home, price and value for money (47%) were relatively more important than eating food that is healthy (40%). Perhaps because of the timing of this particular piece of research (it coincided with the economic crisis), 74% felt their household food bills had increased as a result of increases in food prices; 71% reported that they had made at least one change to their food shopping as a result of price changes. Most commonly these changes were buying food products on special offer (30%) and buying fewer luxury goods (29%).

Surveys that track attitudes over time, for example the Food Standards Agency’s Public Attitudes tracker and the Institute of Grocery Distribution’s Shopper Trends survey, indicate that “health” as a driver of choice has been growing in recent years, although some surveys suggest it became less influential during the recession. In the Food Standards Agency research, three-quarters (73%) had made at least one change to the food that they ate over the previous six months in order to eat more healthily; women (78%) were more likely than men (68%) to have made changes to their diet. The most common changes were trying to eat more fruit and vegetables (35%) and drinking more water (34%).

These were also the two most common changes reported in recent research funded by the Institute of Grocery Distribution, and both had increased over the past four years. Eating “five a day” was the most common response (43% in 2010, compared with 32% in 2006), followed by drinking more water (40% in 2010, against 38% in 2006). Eating low-fat versions of foods was next at 38% (33% in 2006); 24% said they were cutting down on their salt intake (19% in 2006); and 36% said they intended to take more exercise, compared with 35% in 2006.

8 http://www.igd.com/index.asp?id=1&titemid=8&tid=16&cid=1508
Trends over a four-year period for four health-related concerns are shown in figure 1. Alongside these, there have been changes in other food-related attitudes. For example, ethical issues such as fair trade as a driver of product choice increased from 8% in 2006 to 13% in 2010, and concern about animal welfare standards increased from 10% to 19%, whereas reference to organic fell from 10% to 7% and reference to "environmentally friendly" has remained fairly constant over the four-year period at 13%/14%. Over the four-year period the brand name as a consideration had decreased in importance to shoppers, from 41% to 29%, but price became an increasingly important consideration, rising from 29% in 2008 to 47% in 2010.

**Figure 1: Health as a driver of product choice in the UK in 2006–10**  
*Drivers of product choice – health (%)*  

![Bar chart showing trends in health-related concerns over a four-year period.](image)

Q3 (base = all main shoppers)

Source: Institute of Grocery Distribution Shopper Trends 2010 (reproduced with kind permission)

The Institute of Grocery Distribution survey revealed social differences. For example, only 26% of shoppers from social class grades D–E claimed to meet the five-a-day target, showing no increase since 2006. By comparison, 50% of A–B grades and 48% of C1–C2 grades make this claim, the latter showing an increase of 25 percentage points over the four-year period.
Food Standards Agency research on food issues of concern, published at the end of 2009, found that food poisoning topped the list of spontaneous responses, at 21%, followed by food hygiene when eating out (16%). The amount of salt (12%) and fat (10%) in food were less likely to be given as spontaneous responses. However, when prompted and spontaneous responses were combined, nutritionally related issues were in the top six responses: food poisoning (49%), amount of salt in food (48%, compared with 42% in the previous wave; a statistically significant increase), food hygiene when eating out (47%), amount of fat in food (43%), amount of sugar in food (40%), and amount of saturated fat in food (38%). By contrast, concern about use of pesticides scored 30% and food miles 22%. Younger respondents (16-35 years) tended to be less concerned than those aged 36-65 years (this achieved statistical significance).

Figure 2 provides a comparison of different considerations in 2010, highlighting those factors mentioned first by respondents.

**Figure 2: A ranking of the factors driving product choice in 2010**

<table>
<thead>
<tr>
<th>1</th>
<th>Price</th>
<th>First mention</th>
<th>14</th>
<th>47%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Know all ingredients</td>
<td></td>
<td>25</td>
<td>33%</td>
</tr>
<tr>
<td>3</td>
<td>Fat content</td>
<td></td>
<td>8</td>
<td>33%</td>
</tr>
<tr>
<td>4</td>
<td>Brand name</td>
<td></td>
<td>11</td>
<td>29%</td>
</tr>
<tr>
<td>5</td>
<td>Sell-by date</td>
<td></td>
<td>3</td>
<td>28%</td>
</tr>
<tr>
<td>6</td>
<td>Sugar content</td>
<td></td>
<td>2</td>
<td>24%</td>
</tr>
<tr>
<td>7</td>
<td>Salt content</td>
<td></td>
<td>1</td>
<td>24%</td>
</tr>
<tr>
<td>8</td>
<td>Country of origin</td>
<td></td>
<td>8</td>
<td>20%</td>
</tr>
<tr>
<td>9</td>
<td>Taste</td>
<td></td>
<td>5</td>
<td>20%</td>
</tr>
<tr>
<td>10</td>
<td>Animal welfare standards</td>
<td></td>
<td>4</td>
<td>19%</td>
</tr>
<tr>
<td>11</td>
<td>Ethical (eg Fairtrade)</td>
<td></td>
<td>2</td>
<td>13%</td>
</tr>
<tr>
<td>12</td>
<td>Environmentally friendly</td>
<td></td>
<td>1</td>
<td>13%</td>
</tr>
<tr>
<td>13</td>
<td>No artificial colours or flavours</td>
<td></td>
<td>1</td>
<td>13%</td>
</tr>
<tr>
<td>14</td>
<td>Looks nice</td>
<td></td>
<td>1</td>
<td>9%</td>
</tr>
<tr>
<td>15</td>
<td>Time food takes to reach store</td>
<td></td>
<td>2</td>
<td>8%</td>
</tr>
<tr>
<td>16</td>
<td>Availability of usual</td>
<td></td>
<td>1</td>
<td>8%</td>
</tr>
<tr>
<td>17</td>
<td>Organic</td>
<td></td>
<td>1</td>
<td>7%</td>
</tr>
<tr>
<td>18</td>
<td>GM free</td>
<td></td>
<td>1</td>
<td>6%</td>
</tr>
<tr>
<td>19</td>
<td>Trying new foods</td>
<td></td>
<td>1</td>
<td>6%</td>
</tr>
<tr>
<td>20</td>
<td>Stories in papers/news</td>
<td></td>
<td>1</td>
<td>1%</td>
</tr>
</tbody>
</table>

Q3 (base = all main shoppers) 6% None of these/Don’t know

Source: Institute of Grocery Distribution Shopper Trends 2010 (reproduced with kind permission)

This, of course, is what people say they do. What they actually do is discussed later.

**What are the principles of a healthy diet?**

Discussions about sustainability of the food supply sometimes pay scant attention to the relationship between food and health, or the fact that food is a basic need, associated with our requirement for energy (calories), protein, essential fatty acids, and a number of essential vitamins and minerals that we are unable to synthesise for ourselves. Furthermore, food choices are driven to a large extent by social, cultural and economic factors and, particularly in developing countries, by aspiration.

There is no single formula for achieving good nutrition. As consideration of world cuisines makes clear, around the world many different dietary patterns, derived from foods available locally, support health, reproduction, growth and development. Nevertheless, there are basic principles that apply regardless of the dietary pattern adopted, and nutrient reference values are similar around the globe. Table 1 outlines the recommendations that apply in the UK.

Statistics published at the beginning of 2010 from the UK’s National Diet and Nutrition Survey reveal that positive changes in the British diet have taken place since the last survey was conducted 10 years ago.\(^\text{10}\) Average saturated fat intake among adults still exceeds the reference value of 11% but has dropped slightly to 12.8% of food energy, compared with 13.3% in 2000/01. Men and children are eating less added sugar, although average intakes are above the 11% reference value at 12.5%.

Trans fat intakes have also continued to fall gradually and are now at 0.8% of food energy, which is well within recommended levels (the upper limit is 2% of energy intake) and lower than in many other countries, where reformulation has been less extensive. Some are pushing for legislation to help ensure that trans fat intakes fall still further, but when the scientific evidence was examined by the government’s Scientific Advisory Committee on Nutrition (SACN),\(^\text{11}\) it was concluded that legislation to stimulate further reduction was unlikely to deliver additional public health benefit and might even have unintended consequences for other aspects of diet.

Average intake of fruit and vegetables among adults is now 4.4 portions a day, with over a third of men and women now meeting the five-a-day guideline. In other respects, the overall diet and nutrition picture for the UK population is broadly similar to previous

\(^{10}\) [www.food.gov.uk/science/dietarysurveys/ndnsdocuments/ndns0809year](http://www.food.gov.uk/science/dietarysurveys/ndnsdocuments/ndns0809year)

\(^{11}\) Scientific Advisory Committee on Nutrition *Update on Trans Fatty Acids & Health* (Stationery Office, 2007)
surveys in the National Diet and Nutrition Survey series carried out between 1992 and 2001. People are still not eating enough fibre; average intakes are 13g per day for adults, some way below the recommended 18g.

Consumption of oily fish, which is the main source of beneficial omega 3 fatty acids, remains low; adults and children alike are generally eating much less than the recommended one portion per week. Overall, vitamin and mineral intakes among the population are slightly improved, but iron intakes among girls aged 11-18 years and in women are still low in many cases, increasing the likelihood of iron deficiency and anaemia. Table 1 summarises the extent to which the principles of a healthy diet are being achieved in the UK.

So, the recent National Diet and Nutrition Survey\(^\text{12}\) provides some good news, but also emphasises that further improvements are required if guidelines are to be met. Supermarkets today provide a wide range of healthy foods, and packaged foods now almost routinely carry front-of-pack information illustrating what they offer in terms of calories, saturated fat, salt and sugars, sometimes supported by claims about the food’s contribution to nutrition and health. But the nation’s diet will not change unless we make use of this information as a tool to change the foods we buy and eat. A considerable amount of research has been conducted to demonstrate that people can understand and utilise on-pack nutrition information, but as yet there is little evidence of sustained behaviour change as a consequence.\(^\text{13}\)

In recent years, government-led health promotion campaigns in the UK have focused on salt and, most recently, saturated fat reduction. With regard to salt intake, the target is 6g per day and the average population salt intake among UK adults has fallen from 9.5g in 2000/01 to 8.6g in 2008.\(^\text{14}\) The initiative involved co-operation between the Food Standards Agency, the food industry and a range of other stakeholders, and combined product reformulation, public awareness campaigns and enhanced information provision on products.

\(^{12}\) Food Standards Agency, op cit (2010)


\(^{14}\) National Centre for Social Research & Medical Research Centre An Assessment of Dietary Sodium Levels Among Adults (Aged 16–64) in the UK General Population in 2008, Based on an Analysis of Dietary Sodium in 24-hour Urine Samples (2008) (http://www.food.gov.uk/multimedia/pdfs/08sodiumreport.pdf)
### Table 1: Summary of achievement of dietary recommendations in the UK

<table>
<thead>
<tr>
<th>Recommendation</th>
<th>Reason for the recommendation</th>
<th>Is the recommendation being met?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit and vegetables</td>
<td>At least 5x80g portions/day&lt;br&gt;↓ risk some cancers, CVD and other chronic diseases</td>
<td>4.4x80g portions/day in adults</td>
</tr>
<tr>
<td>Oil-rich fish</td>
<td>At least 1x140g/week&lt;br&gt;↓ risk CVD</td>
<td>0.3x140g portion/week among adults</td>
</tr>
<tr>
<td>Non-milk extrinsic sugars</td>
<td>&lt; 11% food energy (~60g/day)&lt;br&gt;↓ risk dental caries</td>
<td>Average 12.5% energy</td>
</tr>
<tr>
<td>Fat</td>
<td>Reduce to average of 35% food energy&lt;br&gt;↓ risk CVD and ↓ energy density of diets</td>
<td>Average 33% energy across the population</td>
</tr>
<tr>
<td>Saturates</td>
<td>Reduce to average of 11% food energy&lt;br&gt;↓ risk CVD and ↓ energy density of diets</td>
<td>Average 12.8% energy</td>
</tr>
<tr>
<td>NSP (fibre)</td>
<td>Average 18g/day (adults)&lt;br&gt;To improve gastrointestinal health</td>
<td>Average 13g/day</td>
</tr>
<tr>
<td>Alcohol limits</td>
<td>3-4 units/day (♂); 2-3 units/day (♀)&lt;br&gt;Minimise risk of liver disease, CVD, cancers, injury from accidents and violence</td>
<td>60% (♂) exceed 44% (♀) exceed</td>
</tr>
<tr>
<td>Salt</td>
<td>Average 6g/day (2.4g/day sodium)&lt;br&gt;↓ risk hypertension and CVD</td>
<td>Average 8.6g/day</td>
</tr>
<tr>
<td>Vitamins/minerals</td>
<td>Dietary reference values&lt;br&gt;To promote optimum health and prevent deficiency</td>
<td>Low intakes seen for a number of these in various age groups</td>
</tr>
<tr>
<td>Energy intake</td>
<td>2,500kcal (♂); 2,000kcal (♀)&lt;br&gt;↓ risk of obesity, some cancers, CVD and type 2 diabetes</td>
<td>80-90% EAR</td>
</tr>
<tr>
<td>Body weight</td>
<td>BMI 18.5-25kg/m²&lt;br&gt;66% (♂) &amp; 53% (♀) over BMI 25</td>
<td>66% (♂) &amp; 53% (♀) over BMI 25</td>
</tr>
</tbody>
</table>

Notes: BMI = body mass index; CVD = cardiovascular disease; EAR = estimated average requirement; ♂ = male; ♀ = female.

But there has been much less of a spotlight on vitamin and mineral intakes. This is perhaps surprising, given the evidence that many in the population are not acquiring sufficient of these nutrients through their diet.\textsuperscript{15}

**Vitamins and minerals – important too**

Intakes and nutritional status are both low for a number of essential vitamins and minerals, especially in older children, young adults and older people living in institutions.\textsuperscript{16} Table 2 shows the situation for British females. There is also evidence of marked differences in dietary intake and nutritional status associated with economic status (receipt of benefits) and smoking. Detailed information from the most recent National Diet and Nutrition Survey is yet to be published, but in the survey of adults conducted in 2000/01,\textsuperscript{17} intakes below the lower reference nutrient intake (LRNI) (which by definition are likely to be inadequate for most people) were reported for eight nutrients: vitamin A, riboflavin, iron, calcium, magnesium, potassium, zinc and iodine. Individuals with low intakes of one micronutrient were also likely to have low intakes of the others. Low status (typically blood concentrations) was evident for thiamin, riboflavin, vitamins B6 and B12, vitamin C, folate, iron and vitamin D,\textsuperscript{18} and again the variables were strongly associated with each other.

A recent analysis of National Diet and Nutrition Survey data\textsuperscript{19} was undertaken to determine the dietary and non-dietary characteristics of those with intakes of vitamins and minerals classified as low (below the LRNI) or borderline (between the LRNI and the estimated average requirement or EAR) during the seven-day recording period. It also looked at the characteristics of those with low or marginal status for vitamins and minerals. Those with low intakes/status were more likely to be smokers and/or living in a household in receipt of benefits, and/or less likely to report taking supplements.

The picture for some nutrients is particularly concerning. Iron intakes in girls and women of childbearing age are low compared with the reference values, with up to 50\% of some age groups having intakes below the LRNI (table 2), and low status is also evident in a smaller percentage of males and females.

\textsuperscript{15} Scientific Advisory Committee on Nutrition *The Nutritional Wellbeing of the British Population* (Stationery Office, 2008)
\textsuperscript{16} Ibid
\textsuperscript{19} Ibid
Table 2: Percentage of British females with intakes of vitamins and minerals from food that are likely to be inadequate\(^\text{20}\)

*Percentage with intakes below the LRNI*

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>4–6</th>
<th>7–10</th>
<th>11–14</th>
<th>15–18</th>
<th>19–24</th>
<th>25–34</th>
<th>35–49</th>
<th>50–64</th>
<th>65+</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riboflavin</td>
<td>0</td>
<td>1</td>
<td>22</td>
<td>21</td>
<td>15</td>
<td>10</td>
<td>5</td>
<td>56</td>
<td>9</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>5</td>
<td>0</td>
<td>1</td>
<td>5</td>
<td>5</td>
<td>1</td>
<td>2</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Folate</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>3</td>
<td>2</td>
<td>2</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>6</td>
<td>10</td>
<td>20</td>
<td>12</td>
<td>19</td>
<td>11</td>
<td>8</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Iron</td>
<td>1</td>
<td>3</td>
<td>45</td>
<td>50</td>
<td>42</td>
<td>41</td>
<td>27</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Calcium</td>
<td>2</td>
<td>5</td>
<td>24</td>
<td>19</td>
<td>8</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Magnesium</td>
<td>1</td>
<td>5</td>
<td>51</td>
<td>53</td>
<td>22</td>
<td>20</td>
<td>10</td>
<td>9</td>
<td>23</td>
</tr>
<tr>
<td>Zinc</td>
<td>26</td>
<td>10</td>
<td>37</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
</tbody>
</table>

Note: The LRNI (lower reference nutrient intake) is the amount of a specified nutrient that is likely to be adequate for only 2.5% of the population group to which it pertains.

There is widespread evidence of poor vitamin D status in the UK (see table 3), and the deficiency disease rickets is now being reported in some UK communities, particularly those in which there is likelihood of poor status among young women of childbearing age, who begin pregnancy with low stores, and where customs require women to cover their skin in public (which prevents skin synthesis of the vitamin). It is also being seen within some African-Caribbean communities in the UK.

The Scientific Advisory Committee on Nutrition (SACN) has reiterated the original 1991 advice from the Committee on Medical Aspects of Food Policy\(^\text{21}\) on the need for vitamin D supplementation of vulnerable groups: infants and young children, pregnant and breastfeeding women, older people, and black and ethnic-minority groups. However, poor status is also evident in the general population, as revealed by an analysis of a UK cohort of middle-aged adults, especially during the winter months when the wavelength of sunlight is insufficient to support the synthesis of vitamin D in skin. In winter/spring, 15.5% of adults aged 47 years had low vitamin D status, compared with 3.2% during summer/autumn.\(^\text{22}\)

\(^{20}\) Ibid
\(^{21}\) Committee on Medical Aspects of Food Policy Dietary Reference Values for Food Energy & Nutrients for the United Kingdom (Stationery Office, 1991)
\(^{22}\) Hyppönen, E and Power, C "Hypovitaminosis D in British Adults at Age 45 Years: Nationwide Cohort Study of Dietary and Lifestyle Predictors" in *American Journal of Clinical Nutrition* vol 85, no 3 (2007)
### Table 3: Prevalence of low vitamin D status in the UK

*Percentage with 25-hydroxyvitamin D below 25 nmol/l*

<table>
<thead>
<tr>
<th>Age (years)</th>
<th>Males (%)</th>
<th>Females (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>4–6</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>7–10</td>
<td>4</td>
<td>7</td>
</tr>
<tr>
<td>11–14</td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>15–18</td>
<td>16</td>
<td>10</td>
</tr>
<tr>
<td>19–24</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>25–34</td>
<td>16</td>
<td>13</td>
</tr>
<tr>
<td>35–49</td>
<td>12</td>
<td>15</td>
</tr>
<tr>
<td>50–64</td>
<td>9</td>
<td>11</td>
</tr>
<tr>
<td>65–74 (living in the community)</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>75–84 (living in the community)</td>
<td>5</td>
<td>15</td>
</tr>
<tr>
<td>85+ (living in the community)</td>
<td>13</td>
<td>25</td>
</tr>
<tr>
<td>65–84 (in institutions)</td>
<td>36</td>
<td>38</td>
</tr>
<tr>
<td>85+ (in institutions)</td>
<td>42</td>
<td>37</td>
</tr>
</tbody>
</table>


Other nutrients of concern are the B vitamins folate, riboflavin and B12. SACN has reported that folate status is low or marginal in 8% of young women aged 19–24 years and 4% of those aged 25–34 years, despite the importance of folate for embryonic development during pregnancy. Among people over the age of 65, 16% of those in institutions and 8% of those who are free living have low status. In light of this, SACN has supported continued use of folic acid supplementation (400µg per day) by women who may become pregnant (and during the first 12 weeks of pregnancy) and has recommended mandatory fortification of flour.

23 Scientific Advisory Committee on Nutrition *Folate & Disease Prevention* (Stationery Office, 2006)
SACN has also highlighted the widespread prevalence of poor riboflavin status in the UK and the existence in the older population of low vitamin B12 status, which may have serious neural consequences and is thought to affect 5-10% of individuals but is typically related to malabsorption (which becomes more common with ageing) rather than a dietary deficit.  

Perhaps not surprisingly, those with the lowest intakes of vitamin A, riboflavin, iron, calcium, magnesium, potassium, zinc and iodine consumed a generally unbalanced diet compared with those with the highest intakes, characterised by consumption of significantly less of almost every food group (see table 4 and figure 3), with some evidence of increased consumption of foods with a poorer nutrient density.

Other key indicators associated with lower nutrient status were lower consumption of fish and fish dishes, and of fruit and vegetables (particularly fruit). The analysis also provides evidence that soft drinks (excluding fruit juice) may be replacing milk in the diets of those with low riboflavin intake; and those with the lowest status for vitamin B12, riboflavin, folate and vitamin C consumed less breakfast cereal (which is frequently fortified).

**Figure 3: The ‘Eatwell’ plate**
*Showing how much of what we eat should come from each food group*

![Image of the 'Eatwell' plate]

Source: Food Standards Agency

25 Ibid
Important sources of those vitamins and minerals identified by SACN as of potential concern are listed in table 4. Readers will notice that foods rich in protein, such as meat and milk, are a prominent feature of this list of dietary sources.

**Healthy dietary patterns**

A principal components analysis of the National Diet and Nutrition Survey was also conducted to provide information on the characteristics of four different eating patterns. The pattern labelled “healthy” was characterised by higher consumption of fish/fish dishes and fruit/vegetables. People following this pattern were least likely to be smokers. This pattern resulted in the highest status levels for all variables except iron and the highest intakes of some of the nutrients.

The dietary patterns labelled “traditional” included higher consumption of a range of food types, including meat/meat products, cereals/cereal products, milk/milk products and eggs. It yielded the highest mean intakes for the majority of the nutrients assessed and results for the status variables that were similar to, but in some cases lower than the “healthy” pattern. Iron status was highest in the traditional pattern.

The pattern labelled “unhealthy” included higher consumption of soft drinks (excluding fruit juice) and savoury snacks, and was associated with the highest smoking prevalence and the greatest likelihood of being in receipt of benefits. This pattern yielded the lowest mean intakes for all the nutrients considered and for most nutrients the lowest status.

A fourth pattern was described as “unlabelled” as there were no particular characteristics.

These analyses strengthen the need to promote diet within the context of a healthy lifestyle and suggest that micronutrient requirements are more likely to be met if a varied diet, typified by the Eatwell plate model (see figure 3), is consumed. Fish/fish dishes and fruit/vegetables are key indicators and should be promoted, whereas regular consumption of large amounts of savoury snacks, confectionery and soft drinks could be displacing other foods rich in micronutrients from the diets of those with low micronutrient intakes and/or status.

SACN suggests that consideration should be given to promoting the replacement of some soft drinks with low-fat milks. High-priority groups for receiving targeted healthy eating advice are young adults, smokers and those living in households receiving benefits.

26 Scientific Advisory Committee on Nutrition, op cit (2008)
Table 4: Dietary sources of vitamins and minerals identified by SACN as of potential concern, based on evidence of low intake and/or low status in the UK population

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>Low intake</th>
<th>Low status</th>
<th>Dietary sources in the UK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Calcium</td>
<td>✔</td>
<td>n/a*</td>
<td>Milk, cheese and other dairy products, some green leafy vegetables (eg broccoli and cabbage), fortified white and brown bread, fortified soya products and fish eaten with the bones (eg sardines, tinned salmon and whitebait)</td>
</tr>
<tr>
<td>Folate</td>
<td>✔</td>
<td></td>
<td>Green leafy vegetables, brown rice, peas, oranges, bananas and fortified breakfast cereals</td>
</tr>
<tr>
<td>Iodine</td>
<td>✔</td>
<td>n/a*</td>
<td>Sea foods (eg sea fish, shellfish and seaweed) and milk</td>
</tr>
<tr>
<td>Iron</td>
<td>✔</td>
<td>✔</td>
<td>Liver, red meat, pulses, nuts, eggs, dried fruits, poultry, fish, whole grains and dark green leafy vegetables; also fortified white and brown bread and breakfast cereals</td>
</tr>
<tr>
<td>Magnesium</td>
<td>✔</td>
<td>n/a*</td>
<td>Green leafy vegetables, nuts, bread, fish, meat and dairy products</td>
</tr>
<tr>
<td>Potassium</td>
<td>✔</td>
<td>n/a*</td>
<td>Fruit (particularly bananas), vegetables (including potatoes), meat, fish, shellfish, nuts, seeds, pulses and milk</td>
</tr>
<tr>
<td>Riboflavin</td>
<td>✔</td>
<td>✔</td>
<td>Milk, eggs, rice, fortified breakfast cereals, liver, legumes, mushrooms and green vegetables</td>
</tr>
<tr>
<td>Thiamin</td>
<td>✔</td>
<td></td>
<td>Whole grains, nuts, meat (particularly pork), fruit and vegetables, fortified breakfast cereals and fortified white and brown bread</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>✔</td>
<td></td>
<td>Retinol: liver, whole milk, cheese, butter, margarine and many reduced fat spreads Carotenoids: carrots, dark green leafy vegetables and orange-coloured fruits (eg mangos and apricots)</td>
</tr>
<tr>
<td>Vitamin B6</td>
<td>✔</td>
<td></td>
<td>Poultry, white fish, milk, eggs, whole grains, soya beans, peanuts and some vegetables</td>
</tr>
<tr>
<td>Vitamin B12</td>
<td>✔</td>
<td></td>
<td>Meat, fish, milk, cheese, eggs, yeast extract and fortified breakfast cereals</td>
</tr>
<tr>
<td>Vitamin C</td>
<td>✔</td>
<td></td>
<td>Fresh fruits (particularly citrus fruits and berries), green vegetables, peppers, tomatoes and potatoes (particularly new potatoes)</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>n/a**</td>
<td>✔</td>
<td>Oily fish, eggs, fortified cereals and margarine</td>
</tr>
<tr>
<td>Zinc</td>
<td>✔</td>
<td>n/a*</td>
<td>Meat, milk, cheese, eggs, shellfish, wholegrain cereals, nuts and pulses</td>
</tr>
</tbody>
</table>

n/a* Not available. Evidence on nutritional status for specific micronutrient not evaluated by SACN.

n/a** Not available. Vitamin D is also obtained from the action of sunlight on the skin. There are no Dietary Reference Values specified for Vitamin D intake for people aged 4 – 64 years.

Note: Although the evidence indicates that some population groups in the UK have low intakes of eight vitamins and minerals compared with dietary requirements, for some micronutrients (for example, magnesium, potassium and zinc) the dietary reference values are based on limited data, so caution should be used when assessing adequacy of intake using the LRNI.
The impact of income
In recent years, the UK has experienced rapid rises in food prices driven by global perturbations in the food supply, increasing the amount spent on food and having the greatest impact on low-income families. According to the Department for Environment, Food & Rural Affairs’ Family Food Survey, households spend an average of £36.32 per person per week on food and non-alcoholic drinks. On average, this accounts for 11% of all expenditure but represents nearly 17% of expenditure for a low-income household, compared with 15% in 2005.

Defining a healthy and sustainable diet
A major challenge going forward will be to identify dietary patterns that provide the many nutrients we need for health, in appropriate amounts, but that are also equitable, affordable and sustainable in the context of the challenges and realities set down in the Government Office for Science’s food research and innovation strategy and the Food 2030 strategy. These include the increasing global population and associated demand for food and water; competition for agricultural land from multiple sources (industry, housing, leisure, fuel); the impact of climate change on agriculture, aquaculture, water and land use, and biodiversity; the changing dynamics in developing countries resulting in increased demand for higher-protein foods, in particular meat; the impact of global food distribution networks; the impact of increased lifespan in many countries; the public’s attitudes to food and farming (including those associated with genetic modification, organic food, use of pesticides and animal welfare/ethical treatment of animals); the need to ensure food safety; and the need to minimise food waste throughout the food chain, including in the home.

SACN’s analyses emphasise the importance of a balanced diet approach in order to help ensure the population meets its many nutrient requirements, and indeed to improve upon the current situation. As set out in the Government Office for Science’s food research and innovation strategy, the issues around food are frequently complex, interconnected and multifaceted, and solutions must take account of this complexity to be coherent.

Also, there are competing pressures in the food system, a good example being fish: this is the only significant source of long-chain omega 3 fatty acids, yet stocks are dwindling.

29 Department for Environment, Food & Rural Affairs Food 2030: How We Get There (2010)
and aquaculture environmentally inefficient. To ensure that unintended consequences are avoided, there is a need to adopt a cautious approach in the process of making recommendations about future diet, as we begin the journey of combining the sustainability agenda with what we already know about nutrient requirements and the nutrient intakes and nutritional status of the UK population.
Chapter 4

Sustainability and food production – the scientific perspective

Ian Crute, Chief Scientist at the Agriculture & Horticulture Development Board
Sustainability and food production – the scientific perspective

This paper deals with the concepts of sustainability as they relate to the production of food from farmed crops and animals (excluding farmed fish). The emphasis is placed on primary production as distinct from subsequent steps in the food chain that involve storage, packing, processing, distribution and retailing. The reason for this is that issues of sustainability beyond the farm gate are relatively straightforward to quantify and deal with, since reduction in use of fossil fuel derived energy is almost the only consideration. In contrast, activities before the farm gate result in emissions of greenhouse gases from complex biological processes (primarily nitrous oxide and methane), which are integral with the productive management of land and ecosystems. In addition, there are often consequential changes in land use, with significant impacts on system sustainability.

Understanding sustainability

“Sustainability” has become a watchword of the past two decades. It is perhaps unfortunate, however, that overuse of the word has devalued the strength of its currency for conveying some embodied concepts of great significance.

In the context of global economic development, the Brundtland Commission of the United Nations almost 25 years ago came forward with the most commonly quoted definition: “sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs”. Subsequently, the requirement to recognise and reconcile the so-called “three pillars of sustainability” – environmental, social and economic – was emphasised at the 2005 World Summit (figure 1), while among these three pillars the overarching primacy of the environment (figure 2) has been forcefully advocated.

With regard specifically to food production, the UN Food & Agriculture Organization has defined sustainable agriculture as that which “conserves land and water, as well as plant and animal genetic resources, does not degrade the environment and is economically viable and socially acceptable”.¹ Most recently, in the specific context of crop production (but applicable to agriculture in general), the idea of “sustainable intensification” has been promoted in a study published by the Royal Society.² This concept is accepted as a useful construction and provides the foundation for the discussion in this paper.

Figure 1: Three pillars of sustainability given equal prominence

Figure 2: Societal and economic aspects of sustainability are elements within the overarching predominance of environmental sustainability
Intensification in the context of “sustainable intensification” refers to producing as efficiently as possible on the smallest footprint of land necessary to deliver (and not over-deliver) consistently the required level of production.

The sustainable intensification concept recognises that the primary objective of land use for agriculture is the efficient conversion of solar energy into varied and valued forms of chemical energy (in the form of food and other outputs) for utilisation by mankind. It also recognises that some land is best used to produce forage for animals as intermediates in the energy conversion process; grazing and browsing ruminant animals can eat plant material indigestible by humans and convert it into fats and protein that man can digest. This energy conversion process involves manipulation and management of the interaction between genotype (animal and/or plant) and the manmade environment. This management and manipulation is the essence of what agriculture is and what farmers do.

What do the 166 years of the Broadbalk experiment tell us about sustainability?
Since the mid 19th century, and excluding periods of wartime, home-based British food production has been substantially able to deliver the requirements of the nation’s growing population for indigenous food products as well as accommodating its changing dietary preferences. In practical terms, it can be argued that Britain has enjoyed and benefited from socially acceptable sustainable food production for more than five generations (albeit at a subsidised price for much of this time), with only short periods when required output and actual output were seriously out of balance (see box).

Ten characteristics of a sustainable production system

- Substantially dependent on renewable inputs
- Stable over many generations
- Non-polluting
- Profitable and socially acceptable
- Conserves functional and aesthetic biodiversity
- Conserves valued landscapes
- Maximises resource use efficiency
- Does not transfer problems elsewhere
- Changes to the system are reversible
- Responsive to changing requirements and constraints (for instance, population growth and climate change)
In addition to the historical evidence, based on data describing levels of supply and demand, there is one particularly long-running classical experiment that enables several points about sustainability of production to be made with confidence. The Broadbalk winter wheat experiment at Rothamsted mirrors British arable agriculture and has run continuously since 1843. A selective set of the data collected over more than 160 years is presented in figure 3 (courtesy of Professor Keith Goulding, Rothamsted Research). The primary points to be made from these data are as follows:

- Consistent and undiminished yields have been achieved from the same plots for as long as 166 years in some cases; but while this is indeed a long time, it represents but a small fraction of the time that wheat has been grown in British soil. Can we be sure we can maintain such progress in the face of constraints such as climate change, fertiliser availability and changes in pest and pathogen populations?

- The period from 1970 to 2000 saw a doubling of yield from plots of continuous wheat based on semi-dwarf varieties, which could benefit from higher fertiliser applications without lodging, and also the advent of chemical herbicides and fungicides.

- Plots of wheat grown in rotation over the past 40 years have delivered 200% yield increases of up to 10 tonnes per hectare.

What is not evident from the Broadbalk data is that in the past decade, increases in British on-farm yields of wheat have stalled, despite steady incremental improvements in the genetic potential of new varieties. Full potential is only realised when crop management is optimised, including particularly the control of pests, diseases and weeds. Similarly, the genetic potential for meat production from cattle, pigs and poultry, as well as milk and egg production from dairy cows and hens respectively, has increased enormously with advances in animal genetics over the past 30 years. However, it is optimised animal nutrition and control of parasites and infectious diseases that ensures this potential is realised.

**Distinguishing renewable and non-renewable resources**

A food production system that is reliant on non-renewable inputs is, by definition, unsustainable. Currently, there are three such inputs: energy derived from fossil fuels, mined rock phosphate fertiliser, and land itself or perhaps, more particularly, the soil.
Food production is not hugely energy demanding, consuming about 4% of global energy in the form of fuel for traction and manufacture of materials, of which 50% is accounted for by nitrogen fertiliser. There is no reason why the natural gas currently used to make nitrogen fertiliser cannot be substituted by renewable sources of energy and hydrogen; only economics makes this impractical at present. Similarly, there are several other potential sources of phosphate when easy-to-access reserves become depleted and the economics of investment in the means for extraction become more favourable.

**Figure 3: Data on yields since 1843 in the Broadbalk winter wheat experiment at Rothamsted Research**

*Yields, varieties and major changes – is this sustainability?*

Soil is a non-renewable resource, and as such it has been significantly undervalued for the benefits it delivers. Soil performs many functions (see box) apart from simply providing the means by which we grow crops. The UK is favoured with proportionately large reserves of resilient, productive soils, which will continue to support sustainable food production if they are well managed as well as being protected from degradation, pollution and, particularly, ill-advised urban development.
Some key functions performed by soil

- Sustains plant growth in natural and agricultural systems
- Microbial breakdown of plant and animal biomass with recycling of essential plant nutrients
- Water holding and regulation of water flows (flood prevention)
- Microbial degradation of organic pollutants
- A large sink for carbon as soil organic matter
- Regulation of soil-borne pests and pathogens

In addition to the long-term depletion of non-renewable inputs, there are similar concerns about the availability of sufficient fresh water. However, the water cycle ensures renewability of this vital input. The problem is that there is competition for the use of water. Collecting, storing and relocating water are key activities necessary to support sustainable production.

Genetics, or more precisely the genetic diversity of crop varieties and livestock breeds, represents a completely renewable resource that is of fundamental importance to sustainable food production. Mankind has continuously adapted the species on which he is dependent for food since the birth of agriculture 10,000 years ago. As a major contributor to the sustainability of systems, modern knowledge of genetics and genomics now makes it possible more efficiently to increase the genetic potential of food crops and animals.

Greenhouse gas emissions and climate change mitigation

A primary attribute of truly sustainable food production systems will be the achievement of a balance between the emissions of greenhouse gases and the carbon that can be captured by photosynthesis.

The unit of measurement for total emissions is conventionally expressed as being in weight of carbon dioxide equivalent (kg CO$_2$ eq). This unit of measurement provides a way of comparing products where emissions of any combination of three particular greenhouse gases (carbon dioxide, methane or nitrous oxide) may have been involved in the processes of primary agricultural production. On an equivalent volume basis, methane and nitrous oxide have many times more global warming potential than carbon dioxide (x289 and x72 respectively), but converting all greenhouse gases to a single measurement of CO$_2$ eq provides the ability to calculate the total global warming potential of a system of production or even a particular product.
Carbon dioxide emissions are a function of fossil fuel-derived energy as well as the burning or biological respiration of carbon stored in biomass above or below ground. Methane (CH\(_4\)) emissions are particularly connected to the production of rice in paddy fields and ruminant livestock (cattle, sheep and goats). Nitrous oxide (N\(_2\)O) results from the action of “denitrifying” bacteria in soil as nitrate (necessary for plant growth) contained in chemical fertilisers, manure and crop residues or from nitrogen-fixing plants is denitrified.

It is estimated that primary agricultural production contributes 7% of the UK’s greenhouse gas emissions (as CO\(_2\) eq). Carbon dioxide emissions from agriculture are a small component, accounting for just 0.7%. For agriculture, natural processes intimately connected to the means of food production are responsible for the remaining 6.3%, and nitrous oxide accounts for 3.5%. The latter results from the natural processes of nitrification and denitrification, mediated by soil bacteria. Nitrogen is an absolute requirement for crop growth (including forage crops) and a primary determinant of the productivity of agricultural systems. It is inevitable that a proportion of the reactive nitrogen in an agricultural system will be lost as gaseous nitrous oxide.

The efficiency of an agricultural system can be defined by the kg CO\(_2\) eq per unit of production (tonne of grain, litre of milk, kilogram of meat, etc). Within the UK it should be possible to define the greenhouse gas emissions that will inevitably result from the most efficient systems producing the home-grown food required to sustain the future population (of, for example, 70 million people in the case of the UK). This figure for greenhouse gas emissions, together with the quantities of agricultural products, could become an important target as an indicator of sustainability (and the sought-after levels of efficiency), provided it were also closely linked to systems for carbon capture and storage on the same timescale (annually, for example). A concentration on increased yields and efficiency would allow more land for forestry, the cultivation of bio-energy crops and the maintenance of permanent grassland, all of which should increase the store of fixed carbon or substitute for burning fossil fuels.

A key question relating to UK land use is whether the balance alluded to above is achievable. If calculations demonstrate there is an imbalance, it will be necessary to seek trade-offs, such that food is purchased from more efficient producers outside the UK, or that the means to fix and store carbon beyond the boundaries of the UK system are purchased. Reducing production and thereby consumption would provide another, but more difficult to achieve, solution.
This approach seems fundamentally sounder that the somewhat arbitrary targets for reductions in greenhouse gas emissions being required by the Committee on Climate Change (3 tonnes of $\text{CO}_2$ eq per annum for England to 2020). These targets are likely to simply create incentives for reductions in production that, without any reduction in demand (unlikely given the projected population increase), will simply result in more imported, and less efficiently produced, food. The outcome of this scenario could be a move away from rather than towards sustainability.

**Weather and adaptation to climate change**

The weather has a great influence on agriculture and food production but it is not possible to predict it with any accuracy more than a few days ahead. This unpredictability, including the increasing frequency of extreme weather, works in opposition to the development of sustainable production systems. This is because it is not possible for producers to predict their levels of output in relation to the required demand by the market. Either undersupply or oversupply may result from this unpredictability, which can lead to waste (see also below), unnecessary resource use and price instability.

Adapting agricultural systems to changing climatic patterns and creating the necessary resilience to compensate for an inability accurately to predict weather will be necessary before food production can be considered genuinely sustainable.

**Pests, parasites, pathogens, weeds, waste and the power of evolution**

Invertebrate parasites of livestock and pests of crops, fungi, bacteria, viruses and weeds all cause major losses. This loss equates to a marked reduction in efficiency, which is probably at least 25% in most production systems. The greenhouse gas emissions involved in producing a tonne of wheat or a kilogram of pig meat from systems where production is constrained by disease are essentially the same as those where disease is minimised and yields are proportionately higher. Hence removing these constraints enables lower emissions of greenhouse gases per unit of production and thereby a potentially major contribution to sustainability. There is, however, a twist, which reflects the power of evolution and works against the achievement of sustainability.

Almost any action that restricts the reproductive output of an organism is likely, over many generations, to result in an evolutionary response to negate its effect. In the case of rapidly reproducing viruses, parasites, microbes and weeds, a control measure may fail, sometimes quite quickly, as variants develop resistance through natural selection.
Biological evolution means that biotic constraints on agricultural production are a moving target that makes the achievement of sustainable controls difficult; this situation therefore requires continual surveillance and adaptive responses.

**Interconnectedness of production systems to achieve sustainability**

Agricultural systems in the industrialised world have tended to become specialised, lacking diversity and often disconnected from one another. For example, in the UK, mixed farms are in the minority and arable production is geographically separated from major livestock production. Cereal straw and livestock manures have been considered troublesome wastes rather than products of value to the sustainability of the whole system. In former times, uses were found for all the biomass produced by agriculture, and the interconnectedness between components was there by design.

It is neither realistic nor desirable to sacrifice the benefits that can accrue to specialisation in terms of return on capital investment and exploitation of expertise. However, there is a need for better connection between components of the food production system in ways that reduce waste, maximise energy inputs and utilise efficiently the biomass that is produced in the process of capturing and converting solar energy for human benefit. This will require detailed systems analysis and examination of how to ensure the most efficient flows of energy from one component of the system to another while minimising resource use and greenhouse gas emissions.

**Research priorities for sustainable food production**

The foregoing discussion focuses attention on the need for research to maintain progress towards future food production systems that will be sustainable, as defined here. At present we are reliant on inputs that are not sustainable, but both economics and inadequate knowledge or technology impede the ability to create or adopt new approaches. Often the data by which to judge the sustainability of particular products or practices is inadequate or entirely absent.

The types of research that need to be accorded priority for progress to be made towards sustainability, identified in general terms, are:

- rigorous greenhouse gas emission accounting for agriculture;
- continuing and relentless drive for highest output, in terms of yield and quality per area of land and non-renewable input, commensurate with market demand;
- genomics-led improvement of the genetic potential of “breeds and seeds” for
resource-use efficiency;

- systems-based approach to optimisation in terms of understanding and quantifying trade-offs from the perspectives of such determinants as economics, greenhouse gas emissions, energy, primary outputs, co-products, soil function/quality, land use and rotations.

**Concluding remarks**

It seems inevitable that increased agricultural production in northern Europe (including the UK) will be vital for global food security in the coming decades. Resilient soils, a sufficiency of water, a warming climate and a high level of intellectual capacity make this prospect not just an opportunity but also an obligation. A sustainable future will demand more food production with less land, water, emissions, energy and waste; the UK has the potential to show the way and gain advantage as a consequence. Investment in science and technology is essential (but not sufficient) to meet the challenge of creating truly sustainable production. It is also important to re-establish a close connectivity between researchers, suppliers and practitioners. In the short and medium term a priority must be some reallocation of available resources to target increases in crop and livestock production.

It can be concluded that truly sustainable systems of food production based exclusively on renewable products and practices are still somewhat distant. However, advances in engineering, information technology and bioscience are revealing a future scenario where we can imagine systems embracing technology that will:

- be based predominantly on exploitation of renewable resources;
- not be subject to instability and unpredictability due to evolution in response to management practices;
- be resilient to the unpredictability of temporal and regional weather patterns, including extreme events; and
- ensure economic viability for producers and affordability for consumers.
Chapter 5

Sustainability and food production— the consumer perspective

Richard Lowe, Deputy Chief Executive of the Agriculture & Horticulture Development Board
Sustainability and food production– the consumer perspective

The post-war history of food retailing in Britain has been characterised by the advent of supermarkets, their growing development and consolidation into integrated national businesses with sophisticated logistics and supply chains, and their provision of tiered food product ranges catering for different consumer segments and meal occasions.

At the same time, as both a cause of and a response to retailers’ developing food ranges, consumer expectations of product availability have risen. With many superstores now being open 24 hours a day, and with fresh food lines being available 52 weeks a year, it is no surprise that consumers have become conditioned to expect to be able to buy what they want, when they want it.

Salad items are available all year round. A full range of fruits and vegetables is on the supermarket shelves during even the darkest winter months. Anything less would be considered an abnormal failure of the food retailing service model. Furthermore, we can now order whatever we want online and have it delivered to our home.

In the past few years, however, as campaigners and national governments have put the spotlight on the carbon cost of different industries, the subject of sustainability and its relationship with the grocery industry has reached centre stage. That the industry should reduce its environmental impact is uncontested, but there remain unresolved challenges with regard to which interventions will yield the most beneficial results.

What are the messages that will enable consumers to exercise informed choice? Can a robust tariff of sustainability be easily communicated which will allow food products to be differentiated, both between food categories (“this cabbage is better than those beans”) and within food categories (“buy these tomatoes rather than those tomatoes”)? Can the food industry coalesce around a single measurement and communication system, through standardised labelling?

Just as importantly, how will consumers react? Notwithstanding a growing interest and desire among consumers to “do their bit” with regard to environmental sustainability, we need to understand the trade-offs which will inevitably arise. What will be their reaction to reduced product availability through choice editing on behalf of retailers? Any restriction of product choice and range availability runs counter to the long-term trend of how our grocery industry has developed.
The limitations of food miles
Will consumers understand that in fact “food miles” are not necessarily an accurate surrogate measure of sustainability? Is there not a strong likelihood that claim and counter-claim from competing interests will serve only to confuse consumers and reduce their trust in the food industry?

The calculation of embedded greenhouse gas emissions in food products is still a very young science. The unit of measurement is conventionally expressed in terms of weight of carbon dioxide equivalent (kg CO₂ eq). In simple terms, this is what is meant by the epithet “carbon footprint”. This enables consumers to compare products where emissions of any combination of three particular greenhouse gases (carbon dioxide, methane and nitrous oxide) may have been involved in the processes of primary production, storage, packing, processing, distribution and retailing.

For equivalent volumes, methane and nitrous oxide have many times more global warming potential than carbon dioxide (x25 and x298 respectively over 100 years), but converting all greenhouse gases to a single measurement of carbon dioxide equivalent makes it possible to calculate the total global warming potential of individual food supply chains and to compare food products produced by very different systems. In this way we can compare the greenhouse gas emissions “cost” of a kilogram of potatoes and compare it with, say, a kilogram of beef or a litre of fruit juice.

Carbon dioxide emissions are a function of fossil fuel-derived energy use in primary food production and in the supply chain. Methane emissions are particularly associated with growing rice in paddy fields and with ruminant livestock (cattle, sheep and goats), whose metabolic conversion of feed to usable energy for growth has methane as a by-product. Nitrous oxide is produced through the action of bacteria in soil, as nitrate (necessary for plant growth) contained in applied chemical fertilisers, manure and crop residues or from nitrogen-fixing plants is “denitrified”. The denitrification process occurs particularly in waterlogged soils and may result from crops for human or animal consumption as well as non-agricultural land.

Any robust measurement of individual food supply chains needs to take into consideration a range of collateral factors, and most of these require some assumptions to be made. So for instance, if we are measuring the greenhouse gas emissions associated with a kilogram of chicken, we need to consider: the source of the feed used in the poultry production process, including where it was grown, what fertilisers were used, and any land use changes associated with the land on
which the feed was grown (was it previously rainforest, which before deforestation would have captured carbon?); the energy use in the production of the feed and its transport; the energy use in the production of the live chickens, their transport and processing; and the energy use in the distribution chain from processing unit to retail store.

A fully comprehensive carbon footprint for a chilled chicken product would also include an assessment of the energy required to transport the product home from the supermarket, to refrigerate and finally to cook it. Calculating the carbon footprint of a food product is therefore a complex business, as well as a young science. For many food products, the majority of the greenhouse gas emissions occur at the farm production stage of the food chain, rather than in processing, transport, storage or chilling.

A fundamental feature of the models to calculate the greenhouse gas emissions per kilogram or litre of product is that they are necessarily based upon a series of assumptions. In the above chicken example, and in the absence of access to detailed farm records for, say, soya farms in South America or cereal farms in North America, one could only calculate the average greenhouse gas emissions of the poultry feed based on a set of assumptions about its production, transportation and storage.

It is common for the media and certain NGOs to quote with authority various tariffs for the greenhouse gas emissions footprint for products such as beef. In reality, it is misleading to ascribe an average emissions cost figure to a kilogram of beef, because the actual emissions figure will be a function of the system-specific way in which that product has been produced. The cattle feed used to fatten cattle in feedlots on the other side of the Atlantic will have a very different greenhouse gas emissions cost to the pasture upon which many of our British cattle graze. Indeed, not only does grassland act as a carbon sink, but also much of the land in Britain used to graze animals has no other practical use for food production.

Fortunately, there is a degree of consistency in approach available to those who seek to define a specific carbon footprint measurement for individual food products. The Carbon Trust has a certificated methodology that can be used by individual manufacturers or food producers to make a claim for their greenhouse gas emissions cost, using the carbon footprint logo which is recognisable to interested consumers. But no one should be in any doubt that the task of conducting detailed audits of individual supply chains for the huge array of food products on retailers’ shelves is a mammoth one, in terms of both time and cost.
Looking beyond emissions
The sustainability agenda is not just about greenhouse gas emissions, however. Use of packaging materials and waste reduction throughout the food supply chain have been the focus of much collaborative project work in recent years. Of increasing interest is the issue of embedded water use in food products, and many commentators would say that this is the current hot topic for major food manufacturers and retailers. While reduction of greenhouse gas emissions associated with the food industry is the essential part of the mitigation strategy with regard to climate change, reduction of water use is very much part of the adaptation response to climate change.

While the food industry is making big efforts to measure its environmental impacts and to establish roadmaps to reduce them, how are consumers reacting and how are they likely to react in the future? Will we be able to discern changing behavioural patterns in the way they buy and consume food?

Recent consumer tracking research conducted by the Agriculture & Horticulture Development Board indicates that around half of all adults agree that they “are very concerned about global warming”, although only 18% agree that “the climate change debate has influenced the way in which I purchase food”.

For consumers the most obvious connection between their food shopping behaviour and its environmental impact is the link between buying local produce and the consequent reduction in food miles, with 44% of adults agreeing that they “try to buy local produce in order to reduce my food miles”. This chimes with the output of recent tracking research from the IGD, which showed a doubling between 2006 and 2010 in the number of shoppers who claimed to have deliberately bought locally produced food in the past month, up from 15% to 30%.

As the IGD’s analysis showed, the reasons for buying locally produced food were a bundle of interrelated factors, with freshness claimed as the number one driver, ahead of supporting the local economy, being good for the environment and being tastier. But it would be fair to say that for many consumers local food equates simplistically to lower food miles.

It is clear from the Agriculture & Horticulture Development Board’s tracking research, however, that the majority of consumers are reluctant to pay more for food products which have been produced with a lower carbon footprint: only 15% say that they would be prepared to pay more, and indeed 12% say that they should pay less (one assumes this is due to their recognition that such food products would have lower
input costs). The majority expect to pay the same.

Indeed, one could make a case that despite the increases in propensity to buy local food, as measured through the above quantitative tracking research, consumers in the UK remain less committed to buying local food than their counterparts in other countries around the world. Recent tracking of consumer attitudes by Datamonitor has shown that consumers in most other Western European countries, Australia, the Middle East and the emerging BRIC countries (Brazil, Russia, India and China) are all more likely to say that they try to buy food produced locally than are consumers in the UK. Of countries involved in the polling exercise, only consumers in the Netherlands have a lower propensity to buy local food.

As alluded to above, there is not necessarily any absolute correlation between, on the one hand, the proximity of food production to its consumption and, on the other, its overall carbon-equivalent footprint. Nevertheless, tracking this criterion of food choice does perhaps indicate that we still have a long way to go before we can anticipate an upsurge in consumer awareness about the sustainability criteria attached to individual food products.

The year-round expectation
As a nation of food shoppers, we have certainly grown accustomed to year-round availability of fresh produce. Figures derived from Kantar Worldpanel, which continuously monitors GB household food purchases through a 25,000-household sample, show that purchased volumes of apples and bananas fluctuate very little throughout the year. The profile of tomatoes’ purchased volume is more seasonal, with peaks reached during the midsummer months, but volume purchases during each of the winter months are still around 60% of the peak summer month.

There are now only a few fruit and vegetable products for which it can be said that they enjoy a strongly seasonal GB demand. Asparagus and raspberry retail sales peak respectively in May and July, but still have a core monthly sales volume in winter of around a quarter to a third of peak monthly sales. Only perhaps strawberries stand out, with a peak monthly sale some eight or nine times that experienced in each low-demand month.

So what is the prognosis for the future? To what extent will the food industry be able to lower its environmental impacts, and what role will consumers play in this? Will a more sustainable food industry be brought about through producer/retailer push or consumer pull?

It is going to be a very complex task to achieve accurate and objective on-pack labelling on the majority of food products against a single set of sustainability criteria, in a way that
is compellingly simple and easy to understand for consumers. It is therefore unlikely that the sustainability challenge will be met merely by supplying on-pack information to enable consumers to make informed choices.

**Figure 1: Seasonal variation in volumes of produce purchased**
*Four-weekly volumes (million kg), 2009*

![Raspberries/Strawberries/Asparagus](chart)

![Bananas/Tomatoes/Apples](chart)

Source: Kantar Worldpanel *GB Household Purchases* (2009)

Much more probable is that retailers and manufacturers will continue to be ahead of mainstream shoppers in terms of the work that they are doing to reduce the environmental impact of their products, across a range of dimensions such as reduced carbon impact, less water use, less packaging, less waste to landfill and more efficient use of transport.
Increasingly, their project work in this area will be one of the key components in their corporate social responsibility strategy. Indeed, increasingly many of their stakeholders will expect them to do the right thing with regard to the environmental sustainability of their supply chains, just as we have seen expectations grow with regard to other criteria such as animal welfare, child labour and Fairtrade.

The inherently competitive nature of the British grocery retailing market, nurtured by both UK and EU competition law, may make it unlikely that a common format of labelling is eventually deployed to assist consumer choice. The desire for differentiation and first-mover advantage might result in a variety of retailer own-label sub-brands or bespoke retailer presentation of on-pack information.

**Benefit to food producers**

None the less, it is possible that the attention which will increasingly be paid to sustainability criteria in the supply chain will not prove to be onerous for primary food producers, but rather could serve to benefit them. This benefit may be seen in two ways.

First, there is a broad correlation in most primary production sectors between efficiency in terms of production costs and efficiency in terms of resource use and greenhouse gas emissions. To that extent, a retailer-directed drive to make their supply chains more sustainable could help producers to lower their costs and to become more competitive.

Second, it will be difficult for retailers to make their supply chains more sustainable without becoming more attached to those chains, taking a keener interest in how all the links in the chain integrate with each other and therefore adopting a more strategic view of how those chains could develop. Stronger linkages will therefore be required between primary producers and retailers in order to measure the impact of interventions to reduce emissions or resource use. These should produce a win-win deal for primary agricultural producers, many of whom have been asking for a more integrated approach to supply-chain management in order to help them manage risk better and to reduce volatility of pricing or demand.

In this way the collateral effect of a strategic drive for greater environmental sustainability could in fact be greater economic sustainability for primary producers, food processors and retailers alike.
Chapter 6

The future of farming

Martin Haworth, Policy Director at the National Farmers' Union
The future of farming

Forecasting farming fortunes is a tricky business.

If you believe the long farm income data series produced by the Ministry of Agriculture (now the Department for Environment, Food & Rural Affairs), the peak year, in real terms, was in 1973. In 1978 the then rising Tory intellectual William Waldegrave (later to become agriculture minister) wrote a book called *The Binding of Leviathan.* Among other things, this predicted a bright future for the farming sector and the rural economy, based around thriving market towns in an essentially local economy. The next 25 years saw farming consistently in the doldrums while the economic spotlight shone on globalisation and the service sector.

Farming incomes fell to their lowest level in half a century in the year 2000. In 2001, the newly appointed secretary of state for food and rural affairs, when asked to predict how farming might change in the next decade, plumped for a big increase in organic food. In 2009 the organic market fell by almost 13%.

Before looking ahead to the next 20 years, it is important to know where British farming has come from. The dominant factor in the past century, here and in the rest of the world, has been the phenomenon known as the agricultural treadmill. While domestic and world population has grown substantially, and per capita income levels have soared, both of which trends have greatly increased the demand for food, farmers have consistently met the challenge of supply. This has been made possible by a combination of factors: the opening up of previously uncultivated areas of the world; improved transport and trade; scientific advances; and technological improvements and mechanisation.

Indeed, so successfully has supply been increased that real prices have consistently fallen: hence the treadmill. Another consequence was surplus production. This, in turn, caused political pressure from more competitive agricultural exporters for changes in world trade rules to curb domestic support policies, reduce the ability to dump on world markets and bring down tariffs on imported goods. An abundance of food, at a time when privatisation was the dominating orthodoxy, also led to an enormous reduction in public investment in agricultural research and development.

1 Waldegrave, W *The Binding of Leviathan: Conservatism & the Future* (Hamish Hamilton, 1978)
The developments mentioned above affected farmers in most of the world. But in Britain there were additional sources of misery, brought about by successive food scares and animal health crises. Salmonella, BSE, swine fever and foot and mouth disease followed in quick succession. Although there was a natural tendency to believe that these outbreaks were in some way the fault of British government or British farmers – either a failure of regulatory systems or a consequence of British farming practice – neither case has been established. No better explanation has been brought forward than simply bad luck.

None the less, these events made a significant impression on the British government, and particularly its Treasury. In an era of global surpluses and trade liberalisation, the economic case for a strong British agriculture did not, in any event, appear strong. The disease outbreaks had been costly – the total damage to the economy of the foot-and-mouth disease outbreak alone was calculated to have been £8 billion. So it would have been a natural conclusion that if British agriculture were an unnecessary risk, a smaller agricultural sector would be a lesser risk. By that time, the thesis that “intensive” agriculture was causing damage to the environment was widely believed. And if lower domestic production led to increased imports from developing countries, that could also be seen as benign.

In the wake of the 2001 foot-and-mouth disease disaster, the government established a commission under Sir Don Curry to look at the future of farming in England and make policy recommendations. The report, which appeared in 2002, can be seen as the high-water mark of the assumptions and attitudes outlined above. Productive farming received little attention; if farming had a commercial future, it was seen more in niche and local markets. Farmers were to receive greater encouragement to diversify their businesses away from the core farming business. More support was to be given to farmers to produce “public goods” in the shape of habitats or landscapes via agri-environmental schemes, to be funded in part by a reduction in the production-linked support then available through the European Union.

‘The agricultural treadmill is over’
Scarcely more than five years later, the agricultural situation, both globally and in this country, presents a totally different picture, to the extent that at least one prominent agricultural economist – Harald von Witzke of Humboldt University in Berlin – states that the agricultural treadmill is over. The reason is that the growth in global demand outstrips the growth in global supply, and this trend will continue for the foreseeable future.
On the demand side, the primary factor is the inexorable rise in global population, although there are indications that this is flattening off. The secondary factor is the increasing affluence in a number of developing countries – particularly China and India.

But, in truth, the world has faced demand increases on this scale consistently for the past century, and the world’s farmers have met the challenge. What is different now? We need to go back to the reasons why the treadmill has persisted in the past and examine whether they are still valid in future.

Can science further increase productivity?
A rapid increase in productivity as a result of science and technology was the principal reason for food production being able to keep pace with demand for the last century. Famously, the “green revolution” of the 1960s and 1970s allowed Asia to feed itself in defiance of the Malthusian predictions of the time. But, as we have seen, the drastic reductions in public funding from the 1980s are likely to have their impact on the world’s ability to increase production, given that there is normally a 20- or even 30-year time gap between the initial basic research and the final practical application. The consequences are already being seen in, for example, trend increases in European cereal yields.

Furthermore, in some parts of the world there has been a public reaction against science, partially as a consequence of food scares such as BSE, which have hindered the adoption of new technologies such as genetic modification and nanotechnology. (It is important to stress that R&D investment has remained strong in Brazil and China, and the US and Asia have not seen the adverse reaction to science.)

Can trade expand?
Agricultural trade has increased significantly since the first steps in liberalisation 20 years ago, but it must be doubtful whether the trend can continue. The Doha round of World Trade Organization talks, launched in 2001 as successor to the Uruguay round, has been stalled for a long time. Trade plainly depends in part on production in new areas of the globe, and as we have seen above, this is unlikely. Increased fuel costs, carbon emission concerns and a renewed interest in local produce in developed countries are all factors that could come into play.

Can we cultivate new areas of land?
The answer to this question seems to be: only to a very limited extent. There may be areas in the former Soviet Union that used to be cropped but have now fallen out of
production, but these are relatively small in global terms. In South America, bringing much more virgin soil into cultivation would be environmentally damaging. In Africa there is a severe shortage of infrastructure and capital.

If global warming is a fact, as the great majority of experts believe, production conditions in many parts of the world – notably Africa, parts of North America and Australia – are certain to deteriorate; although the impacts may not be enormous in our 20-year horizon. And closely linked to climate change is water availability. Globally, 70% of available fresh water is used for agriculture (the figure in the UK is 2%). Large parts of the US and Southern Europe have relied on aquifers, now rapidly depleting. According to the World Wildlife Fund, 700 million people are in effect today “water stressed”; by 2025 that figure could rise to a staggering two-thirds of the world’s population.

This concludes the scene setting for a gaze into the crystal ball at British farming in the next 20 years. Global prices are likely to be higher in the next 20 years – the consensus among economists is at least 10% higher – than in the last two decades. And in contrast to the last century, where we saw a number of discrete periods of high prices, but against a backdrop of a steady downward trend, in future we may see periods of low prices against a generally rising trend. Indeed, extreme volatility is likely to be a constant feature. The very high prices of 2007/08 provoked a global supply response that unfortunately coincided with slowing demand as a result of the credit crunch, resulting in plummeting prices. With two very large supply and demand numbers in approximate balance, any small shift in either will produce a big change at the margin.

Time to increase production

The pendulum has swung. We can expect that in the next 20 years the focus will be very much on farming as a productive industry, not as essentially land managers producing what are inelegantly called “eco-system services”. The newly appointed secretary of state for environment, food and rural affairs, Caroline Spelman, in her first reported words on taking her position, said that she was looking forward to the challenges of the role, foremost of which was “increasing production from British farming”. It is hard to imagine any minister since Peter Walker in 1979 saying that.

In passing, it is worth considering the proposition, mentioned earlier in this chapter, that Britain's future lies in importing increasing amounts from developing countries, and that this would be the morally correct thing to do. The truth is the reverse. As a recent report by Humboldt University remarks:

2 von Witzke, H and Noleppa, S EU Agricultural Production & Trade: Can More Efficiency Prevent Increasing ‘Land-grabbing’ outside of Europe? (Opera/Humboldt University/Agripol, 2010)
While it may be desirable that the poor countries of the world contribute more to meeting their food needs, it has become apparent that these countries will not – even under the best of all realistic scenarios – be close to becoming self-sufficient in the decades ahead. In fact, the food import gap of developing countries is set to quintuple between 2000 and 2030. Therefore, the food needs of the world can only be met when the rich countries produce and export more food and not less, as it is sometimes argued.

An important factor influencing British agriculture in the next 20 years will be the next reform of the European Common Agricultural Policy, to be decided in the next three years and to be implemented for the period 2014-20. Of course there are at this stage a myriad different proposals from interested parties, but essentially there are two distinct approaches. The major difference is whether or not to boost the second pillar of the Common Agricultural Policy (rural development in its widest sense) at the expense of the first pillar (agricultural production).

The early running was made by those who advocate delivering “public goods” in the form of environmental protection and enhancement. But the policy landscape outlined earlier in this paper, and a renewed interest in food security, are shifting the balance of the debate in the other direction. Whatever the outcome, there is no doubt that the sovereign debt crisis around Europe will make it extremely difficult for the Common Agricultural Policy to retain its current level of funding after 2013.

If this analysis is correct then the coming Common Agricultural Policy reform will not be as radical as the last, and the system of direct payments will continue, with the main area of contention being the distribution within and between different European countries. Such an outcome will not be in line with what is still the official British government policy (the 2005 Treasury/environment department vision that all direct payments will be phased out by 2020) but seems likely to be closer to the centre ground in European terms.

One of the prerequisites for a productive British agriculture, able to increase production, is the ability to deal with volatility – which, as we have seen, is likely to become more extreme. To some extent farmers are addressing this through the futures market, and will do so more in the future. This is effective in some sectors, and for some risks such as currency, but is not available for some other sectors or risks. The decoupled direct payments, although they can be criticised as being imprecise and haphazard, are in fact the best mechanism yet devised to allow individual farmers to become more market-oriented and to ride out cyclical downturns. From this perspective, direct payments can be seen as a transitional mechanism towards a future in which farmers can survive through their market returns.
For this to happen, farmers need a better functioning supply chain. If there is one single development that will be critical to the future of farming in this country in the next 20 years, it will be that. Farming comprises, and will continue to comprise, a relatively large number of commercial farms (impossible to quantify, but probably around 75,000 in the UK) that would mainly be classified as micro-businesses, up against an increasingly consolidated processing sector and a very consolidated retail sector. In the circumstances it is not surprising that risks and rewards have not been equitably distributed through the chain. Nor that abuse of dominant positions in the form of unfair practices is rife. A statutory code of practice outlawing unfair practices, independently enforced, and better contractual relations throughout the chain would make a significant difference to the fortunes of British farming.

**Integrating the food chain**

If farming is to be regarded as a commercial business rather than as a land management enterprise, it needs to be seen as an integral part of the food chain. Just as the importance of farming has tended to be neglected in the recent past, it is fair to say that the food industry has been similarly overlooked; a Cinderella when all the attention has been on service industries, particularly in the financial sector. But food processing is actually our largest manufacturing sector, accounting for 6% of GDP, 3.6 million jobs and 5% of our exports. Against the trend, exports have increased for the past four years. With most economists favouring a rebalancing of the economy back towards manufacturing, the food sector is excellently placed to be one of the motors that can lead us out of recession. The food chain is one that needs to be integrated; without a ready supply of domestic, high-quality raw materials there would be little commercial logic for a UK location.

If Britain is to increase agricultural production in future, there is only one way to achieve this. There is no stock of idle land (particularly since the abolition of European set-aside in 2008); the only way is to intensify production. In some cases, intensification has met with consumer resistance – battery cages are a classic example – but the other common objections to intensification, that it causes environmental damage or is harmful to animal welfare, are without foundation. It is the quality of the management that determines the outcomes in these cases, not the size of the farm or the production system. And, insofar as climate change will remain a concern, it is worth noting that greenhouse gas emissions are lower per unit of output in more productive farming systems.

The next five years, at least, will be an era of austerity in public finance. Government-funded R&D is often an easy target for cuts. For the long-term productive future of
British farming this would be short-sighted. New technologies seem certain to play an increasing role and, as the Royal Society concluded in 2009, it would be very surprising if GM production did not play a significant part in the future.

Energy security seems certain to be as big a concern as food security. There is a need to decentralise and decarbonise our energy production. Farmers are well placed to benefit. They are often the owners of land best suited for wind turbines; they have buildings and locations available for solar panels; they have manures and crop waste that can be fed into anaerobic digesters producing bio-gas.

More controversially, they produce crops that can be used to produce biofuel. By the end of this year two plants will consume about 2.2 million tonnes of wheat (total UK production was 14.3 million tonnes in 2009), in addition to a further plant using sugar beet. Some regard such production as immoral in the face of food security concerns, although it is often forgotten that an equal volume of high-protein animal feed is produced as a by-product.

Another way of looking at this issue is that food scarcity is not a current issue, but one which is likely to arise if production does not increase; biofuel creates another market for cereals in the short term, helping profitability and curbing volatility. In the longer term it is likely that second- or third-generation biofuels, which harness enzymes to break down the inedible parts of plants such as the stalk or straw, will become commercially viable.

Given the various national and international targets to which all parties are committed (the Climate Change Act, the EU Renewable Energy Directive, and so forth) it is very unlikely that the incentives will be cut. All in all, farm energy production will become an important fact in the coming years.

Will peak oil change the game?
It would be remiss to review the future of farming without considering the “peak oil” scenario, which some commentators use to predict a very different development from the one given in this paper. According to this scenario, global energy scarcity and high prices will make it uneconomic to use high-energy inputs such as fertilisers, and farming will be forced to adopt low-input organic or quasi-organic systems.

There is truth in part of this analysis: high energy and input costs are very probable, and it will be necessary to develop systems that use inputs as efficiently and effectively as possible – for example, high-tech GPS systems for application of fertilisers and
pesticides. Organic production is currently undertaken for a particular market demand (one that fell considerably in 2009, but may revive in future as consumer incomes recover); universal organic production would, however, very significantly cut production. According to John Nix, the doyen of agricultural costings in the UK, research and experience show that organic cereal yields are between 60% and 66% of conventional cereal farming yields.

Nitrogen fertiliser is a heavy energy user, but its use gives at least five times more energy output; the use of natural gas in its production would be one of the last uses of fossil fuel to be abandoned. Such is the economic interest, it would make sense to invest considerable sums to research production systems based on renewable energy.

The structural development we have seen in British farming over the past 20 years has been a direct response to the "agricultural treadmill". Falling real prices have meant that the scale of operation required to generate sufficient turnover and profit has grown steadily larger. Those most vulnerable have been the traditional medium-sized, mixed, family farms. These have either consolidated into larger units or downsized into part-time holdings where the farm-derived income is only a small part of the total. So, counter-intuitively, the number of both small and large farms has increased and the middle ground has been hollowed out. If anything, official statistics under-record these trends because, particularly in the arable East of the UK, one farmer will in effect farm two or more neighbouring farms under some share arrangement, but the "farmers" in those holdings will still appear on census data.

Although we may now be entering a period where the real price trend is reversed, there is no reason to think that this structural development will not continue. Indeed, a likely scenario is that it will increasingly take hold in the livestock areas in the West of the country.

A consequence of this is that despite the prospects for increasing production, the number of people actively involved in commercial farming will not increase. And those sectors that are more labour-intensive, notably horticulture, will continue to have less time for these activities. It used to be said that farming was the heart of rural communities – this will be less and less true.

This can serve as a useful summary and conclusion to this brief prognosis. In a world where the economic and policy drivers will be indicating a need to increase production in developed countries, British farming will become more commercial, and more integrated into the food chain, and correspondingly less a social issue and
less central to rural development.

The views in this paper are personal and not necessarily those of the National Farmers' Union.
Chapter 7

Technology, food and the consumer

Guy Attenborough, Head of Communications at the Agriculture & Horticulture Development Board, and Ian Crute, Chief Scientist at the Agriculture & Horticulture Development Board
Technology, food and the consumer

Summary
The benefits of technological advance to the primary producer of food and the consumer are linked but are not necessarily entirely coincident. A producer will readily adopt any legal and effective technology that enables easier, more predictable and profitable production, provided there is a market. The latter is substantially dependent on the consumer, whose attitudes and responses cannot be taken for granted and need to be appraised. Safety must always be the primary concern of government, through, in the UK, the Food Standards Agency. However, government must lead in other ways that cannot be left to the market, and the provision of a clear policy framework as well as essential investment in research and knowledge exchange is vital.

Introduction
For at least 150 years, UK agriculture and food production have been founded on science, and the sequential adoption of new technologies has facilitated remarkable advances, which continue to the present day. The first agricultural revolution, in the mid 19th century (based substantially on chemical fertilisers and mechanisation), enabled rapid urbanisation and catalysed the next phase of the industrial revolution. Soon after the turn of the 20th century, the science of genetics began to have an impact on crop and livestock improvement, with spectacular impacts on food availability and quality, which have recently been supplemented by rapid advances in plant and animal biotechnology as well as genomics.

Advanced engineering, effective chemical control of pests, diseases and weeds as well as improvements in livestock health – through the availability of vaccines and other therapies – are among the many technological components that now provide safer, more secure and varied access to food than ever before. Advanced technology plays an enormous role throughout the food chain, from primary production through storage, packing, processing, manufacturing, distribution and retailing; and yet the relationship between the consumer and advances in technology applied to food production and processing is not always a predictable or comfortable one.

Consumers rightly expect the food that they buy to be intrinsically safe, while increasingly there is an interest in the way in which food is produced and manufactured. Animal welfare, fair trade, pesticide use, food additives and the sustainability of the food chain are all issues that are of concern to consumers and can influence their behaviour.
Long-term sustainability is influential on and influenced by the adoption of new technology – and this is explored in other chapters. The focus of this chapter is consumer response to perceived risk and benefit, as exemplified by considerations of technology-driven changes in production and manufacturing practices, or the introduction of so-called “novel” food products.

**Consumer awareness and acceptance of new technology in food production**

Most consumers have little awareness or appreciation of food production systems. They appreciate the ready availability of processed convenience foods, and of clean and blemish-free fruit and vegetables; but they may still express an antipathy to the use of preservatives in food or the use of fungicides and insecticides that make production of high-quality produce possible.

For more than 30 years, almost all UK-grown tomatoes (and cucumbers) have been produced in soil-free hydroponic systems fed exclusively with chemical fertilisers. By definition, these tomatoes cannot be classed as “organic”, despite the fact that most crop protection is achieved by use of resistant varieties, biological control or maintaining glasshouse conditions not conducive to pest and disease; pesticides are very little used. This high-tech, non-traditional approach to crop production has been completely accepted by the consumer, who now enjoys tomatoes throughout the year with a wide choice of shape, size, colour and price.

Surveys indicate that the primary reason “organic” food is selected by those consumers who can afford it is that the use of modern crop protection products is disallowed; these are considered by many to represent an undesirable technology, despite the fact that they make predictable yields of high-quality products possible and therefore more affordable. Most consumers, when asked, would probably express the view that they would prefer food grown without pesticides; despite a stringent regulatory regime, the technology is perceived to have risks to the consumer that somehow outweigh the benefits.

Remaining with the same example, the average consumer is unlikely to be aware that plants generate defensive chemicals of their own when under attack by pests and diseases; some of these “natural” chemicals are intrinsically more toxic than “synthetic” crop-protective chemicals. It is therefore entirely possible that an unsprayed crop product could present a higher toxicological risk to the consumer than one treated with a well-regulated chemical pesticide. There is yet another twist to this scenario. Some synthetic chemicals, referred to as “plant activators”, are themselves non-toxic but when applied to crops can elicit them to switch on their
natural defences and thereby be protected from future attack.

So here we have four "generations" of technology: crops completely dependent on their own defences; "organic" crops protected by "traditional" toxic chemicals with limited efficacy (such as copper and sulphur); crops protected by modern, very effective and regulated synthetic chemistry with highly selective toxicity; and crops protected by synthetic chemicals that stimulate natural defensive chemistry. How does the consumer weigh up the relative risks and benefits? What is "natural", if "natural" is indeed what the consumer seeks? Does the benefit of access to a readily available, affordable, attractive product outweigh any of the risks that might pertain to delivery of this requirement?

Genetic modification
For over 100 years, plant breeders have been using hybridisation and selection to produce disease-resistant varieties of crops. Diseases can completely destroy crops, and globally as much as a third of potential crop yields are estimated to be lost to disease. Genetic resistance to crop diseases caused by viruses, fungi and bacteria is often attributable to the action of a single gene; many hundreds of such genes have been identified and used by plant breeders in most crops over the 10 decades since genetic science began to be applied to crop improvement.

Until about 15 years ago, what these genes were and how they exerted their effects was completely unknown – but it did not stop them being used extensively in breeding programmes. Disease resistance is, for example, one of the key traits that determine whether a new cereal variety is recommended for use by UK farmers. With the advent of molecular and genomic technologies, the identity of plant resistance genes has been elucidated. Most plants contain hundreds of different version of these genes, and the ones that are present in a resistant crop variety but are absent in a susceptible variety can now be identified, isolated and cloned. This advance allows the ready transfer of a desirable gene from an inferior (but resistant) variety to a superior (but susceptible) variety by using the technology of direct gene transfer (also referred to as transgenics or genetic modification), that is, GM. To do this avoids the need to cross the two varieties and thereby also transfer to the superior variety all the undesirable characteristics of the inferior variety as well as the gene for disease resistance (as has been done for decades by plant breeders).

The use of GM is therefore "cleaner", quicker and less costly than achieving the same gene transfer by traditional plant breeding methods. However, the outcome is the same: a disease-resistant superior variety. But there may nevertheless be a
a non-biological difference. The isolated gene may have been patented and the new disease-resistant variety may now be the protected property of a large commercial enterprise that requires a return on the investment it made in its production.

So now we have considered not only several chemical approaches to crop protection (see above) but also two different genetic routes to producing a disease-free crop (using the same gene or genes). The difference is not solely in the technology. The modern crop-protective chemistry may only be available from a large commercial agro-chemical company, and it may be the same company that has, fortuitously, patented the gene and produced the disease-resistant version of the desirable, traditional, superior variety. How does the consumer respond to this complexity?

For the grower, the priority will most often be to adopt the technology that most predictably and cheaply enables the consistent production of a high-quality disease-free crop, with one provision: that the supply chain (ultimately the consumer) will buy it. The grower will probably be quite prepared to buy the GM seed and spray the crop with the modern chemical if it reduces the risk of losing the crop to disease and increases the probability of delivering a high-quality marketable crop.

But how does the consumer respond to this smorgasbord of options for delivery of an outcome they particularly seek? Which combination of attributes do they rate the highest, given that the constraint of disease occurrence means they cannot have them all? Which attribute will the consumer reject: readily available; blemish-free; affordable; pesticide-free; or non-GM – and why?

We do not know the answer to this question, and it will almost certainly not be possible to generalise. Case by case is likely to be the way forward. This becomes clearer when one considers characteristics of food products that primarily provide benefit to the consumer, compared with those that are introduced to make production easier or more profitable for the farmer.

There is good evidence that the very long-chain polyunsaturated fatty acids that are characteristic of “fish oils” provide health benefits. There are also some “natural” phytochemicals in plants, such as glucosinolates and flavonoids, that are believed to be protective against certain cancers. GM can enable crop modifications to be made that are impossible using conventional breeding; or it can speed up the process and enable the outcome to be achieved more affordably.
A “healthy” product is unlikely to bring significantly greater revenue to the grower, but the perceived benefits to the consumer may be such that they outweigh any residual concerns about relative risk. Hence there is a view among many commentators and some scientists that obvious consumer benefit will be a prerequisite for the acceptance in the UK of food derived from GM crops. Nevertheless, benefit to the farmer can bring benefit indirectly to the consumer through availability, continuity of supply and price.

Who benefits from GM?
There are more than 100 million hectares of GM crops already under cultivation worldwide (this is over 6% of the cropped area globally). Two food crops predominate: maize and soya bean. The former has been made resistant to the larvae of several different moths, enabling the crop to be grown without the need to spray insecticides for control of these particular insect pests. This is of great benefit to the farmer, who can more easily obtain high yields and spend less on pesticides. However, the consumer sees benefit indirectly only in the availability and possibly the price of food (which is less of an issue in the developed world than in poor countries).

In the case of maize and soya bean the other trait widely deployed is tolerance of the broad-spectrum herbicide, glyphosate; this enables easy weed control, and hence no competition between weeds and the crop, which translates into higher yield. Again, the grower benefits directly, but the consumer only indirectly. In these cases, if there is a non-GM alternative and the consumer perhaps considers that the benefits from GM all accrue to the grower or the company who sells the seed and the herbicide, what would cause them to choose the GM product preferentially?

Farmers have for thousands of years been striving to reduce the yield losses caused by competitive weeds in crops; labour-intensive hand weeding was the norm in the UK well into the 20th century, and still is in many parts of the developing world. Selective herbicides changed the scene about 60 years ago and a natural development of this technology was the targeted development of GM herbicide-tolerant crops (hardly very different from spraying a lawn or golf green with a selective herbicide to kill broad-leaved weeds).

It is therefore ironic that the emergence of a technology that allowed the easy production of weed-free crops should have been accompanied in the UK by a clamour for “more weeds!”. This illustrates another complexity in achieving acceptance of a new technology. The clamour for weeds came not from the growers (unsurprisingly) or from the consumer (at least not directly) but from those who were looking after
the interests of birds that feed on weed seeds. The impact of food production systems and technology either directly or indirectly on the wider environment is increasingly an issue that must be considered and is among the costs and benefits that feature in consumer choices. This is dealt with more directly in the chapters directed towards consideration of sustainability.

Although the consumer is often given primacy in the sorts of issues discussed thus far, is this always wholly appropriate? When should governments and trans-governmental organisations take a lead? For example, the impact over the next 15 years of EU legislation is likely to reduce the availability of agrochemicals. It has been argued that this policy has been substantially consumer-led. However, it will threaten the ability of producers in the UK and elsewhere in the EU to protect their crops, and thus produce the quality and quantity demanded by the market. The overall impact could be lower yields, the requirement for more land to produce current quantities, increases in consumer prices, and higher imports from non-EU countries using products banned within the EU.

This runs counter to the need to achieve greater food security and to avoid the need to cultivate more land than is necessary in the interests of maintaining carbon sinks in the form of forests and grasslands. In the longer term, reduced reliance on chemical pest and disease control could be mitigated by the greater application of GM technology and positive encouragement through a more relaxed regulatory regime to enable GM varieties to obtain approval for cultivation. What processes do we have to make and implement these logical policy connections, and does the consumer have a role in this?

Another example of the inability of the EU easily to resolve issues pertaining to GM technology is the growing issue of animal feed rations. Europe is heavily dependent on imports of protein, which is a vital component of much animal feed. The widespread move to GM maize and soya bean varieties in the world’s major producing countries has to be underpinned by effective and timely approval systems within Europe for new GM varieties.

The convoluted EU approvals process and the zero tolerance policy towards imports or adventitious co-mingling of non-EU approved GM varieties is a real threat to supplies of certain animal feed ingredients essential to EU livestock production (particularly for pigs and poultry). The result is that Europe could face a shortage of protein imports, higher prices and an increasingly uncompetitive livestock industry. A European Commission study points out that without a change in the EU policy and
approvals process, the worst-case outcome for poultry could be a massive 45% drop in EU production.

Gauging consumer attitudes to technology
GM provides an excellent case study for the way it is necessary to build awareness and accommodate consumer attitudes to the novel and unfamiliar. GM has been making UK media headlines on and off for over a decade, following the sensational headlines such as “Frankenstein foods” during 1999. In 2010, there are still no GM crops cultivated in the UK.

Consumer attitude research published in October 2008 by the Institute of Grocery Distribution showed that a high proportion of consumers (52%) neither supported nor opposed GM, or had yet to form an opinion. This compared with 15% who were strongly opposed and 3% strongly in favour. The remaining 30% expressed only a mild opinion, in that they either tended to oppose (20%) or tended to support GM (10%).

Despite intensive debate, often in the consumer media, the research showed there was no significant shift in the five years since an earlier study in 2003. The Institute of Grocery Distribution summarised that there appeared to be two main reasons why consumer opinion had not polarised:

- Understanding of the science remained limited, with just 7% of consumers able to give an accurate definition of GM foods in sufficient detail to demonstrate complete understanding, that is as “food that has had its genes or DNA altered in some way” or a similar phrase.

- The majority of consumers perceived that GM provides a balance of risks and potential benefits.

The studies showed food safety to be the biggest concern for half of consumers (49% – this does leave 51% with either no or only slight concerns, including those with no opinion), with strong concerns among 37% of consumers relating to the environmental impact of GM. In contrast, the view is widespread that GM could help to improve output and feed a growing world population. Likewise, many consumers also feel GM can help to protect crops against disease and extreme weather. The use of GM crops for non-food products raises less concern than that for food, with only 32% citing a level of concern. The graph below shows that the majority of consumers have an open mind about GM food:
Not surprisingly, the Institute of Grocery Distribution study also showed that people most trust the Food Standards Agency and other independent bodies to provide accurate information about GM food. Independent scientists, who remain free from any commercial interest in this area, are also viewed as a trusted source. While consumers receive information on GM from a variety of other sources, they apparently treat this with a degree of scepticism. It would appear that independence from any financial interest or campaigning stance is given greatest credence by consumers.

Delving more deeply into the data indicates that those unsure about GM are also most focused on the Food Standards Agency as an organisation to provide the reliable information they wish to receive. Supporters of GM are the most likely to trust independent scientists, while those who currently oppose GM are slightly more likely to trust consumer and campaign groups.

GM foods may only be authorised for sale if they are judged not to present a risk to health, not to mislead consumers and not to be of less nutritional value than the foods they are intended to replace. The current procedures for evaluation and authorisation of GM foods are laid down in Regulation (EC) 1829/2003 on GM food and feed.
During 2009, the Food Standards Agency announced the establishment of an independent steering group to shape and manage a public dialogue within the UK on food and the use of genetic modification. The public dialogue aims to provide an opportunity for members of the public to discuss issues surrounding GM food and to express their views based on an elevated understanding of the technology as well as the wider context of how the food chain operates. This type of dialogue may provide a model for the way other potentially contentious new technologies might be openly discussed, with a view to introduction, where consumer benefit may not be immediately obvious.

**Concluding remarks**
Experience shows that food safety is paramount to consumers but that the consumer is also interested in the way that food is produced, and this applies to the technology being deployed as well as to other ethical issues, such as labour use and animal welfare. While there have been enormous changes in agricultural technology over the decades, many of these have been neutral from a consumer perspective. But consumer concerns emerge and need to be accommodated when there is a coincidence between new production technologies and potential or perceived impacts on food safety – however improbable these are, given the prevailing regulatory regimes.

This is well illustrated by the various approaches available for the management and minimisation of losses in crops owing to pests, diseases and weeds. In practice, the farmer has no alternative but to use all the tools that are legally available to achieve durable control. This is because pests, pathogens and weeds naturally evolve to render ineffective control measures based on both chemistry and genetics; they are always moving targets. Integrated control, which is not dependent on any single technology, is a way of providing resilience in the long-term best interests of consumer and producer.

It is ironic that one of the several drives to introduce GM technology was a response to the consumer demand for reduced reliance on crop-protective chemistry in food production systems. At the same time, the technology enabled a more efficient way (compared with time-consuming conventional plant breeding) to apply advances in knowledge about natural plant defences for the benefit of producers and consumers. What this illustrates is that consumers should never be taken for granted and that engagement and building of consumer confidence takes time.

1 See: http://www.food.gov.uk/gmfoods/gm/gmdialogue/
There is an important role for independent organisations like the Food Standards Agency in the process of consumer engagement, and government in general should also be prepared to take a lead by providing a clear policy framework for food production towards 2050. This must include the essential investment in funding for the research and knowledge exchange which will be vital for generating the innovation needed to sustain the industry, from producer to consumer, into the future.
Chapter 8

Honest labelling

Sue Davies, Chief Policy Adviser at Which?
Honest labelling

As food production has become increasingly complex, so have our food choices. A wide range of factors affect what we eat, from health and ethical considerations, quality and taste to ensuring value for money. We are therefore more reliant than ever on the information provided on labels.

Besides information about what a food contains, we expect to be able to tell how foods have been produced as well as where they come from. The environmental impact of the food we eat as well as its nutritional content is becoming a greater priority. A wide range of schemes have been developed in response to our needs, from supermarket and manufacturers’ own ranges to those developed to give us independent assurance, such as organic, Fairtrade and the red tractor scheme. But labelling still needs improving if we are to make genuinely informed choices.

It is therefore encouraging that the government has committed to introducing “honesty in food labelling”, so that consumers can be confident about where their food comes from and its environmental impact.\(^1\) A fundamental review of EU food labelling legislation is also taking place to consolidate and simplify labelling requirements.\(^2\) These initiatives provide an important opportunity to ensure that labelling meets consumers’ needs.

Getting the balance right

Getting the balance right between comprehensive, clear information that addresses most people’s demands and too much information can be a challenge, particularly with efforts to minimise packaging. Food industry priorities may also conflict with those of consumers, as food labels are also an important form of marketing. While consumers want to compare easily across products, companies want to differentiate their brands clearly.

As many shop in a hurry, labels have to be clear and simple, to be understood at a glance. Many claims appear on food to grab our attention, and a lot of information is included on the front of the pack as well as on the back. But despite numerous information sources, such as company websites and helplines, there is still rarely an alternative to providing information on the packaging at point of purchase. It is

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2 Proposal from the European Commission for a regulation of the European parliament and council on the provision of food information to consumers, 30 January 2008
therefore essential that most effective use is made of the limited space available and that key information is prominent, user-friendly and does not mislead consumers.

Whether at European or national level, several fundamental areas still need to be tackled if consumers are to have clear information and confidence in what they eat. More honest labelling is still needed about food quality, its nutritional content, origin, environmental impact and the use of new technologies.

The quality expected?
The first area where more honesty is still needed is in relation to food quality. Some labels may comply with the letter of the law, but we can be surprised by what we find ourselves eating. Numerous Which? reports have, for example, revealed how the chicken in your sandwiches or the ham that you buy may have more water than you expect and other bulking ingredients such as proteins or starches added. The information will be somewhere on the label, but it is not always obvious. The real name of the product may be hidden among the small print obscured by a more appealing brand name.

All ingredients have to be labelled – with an unhelpful exception for alcoholic drinks – while significant ones have to be quantified and key allergens have to be listed. Additives will be shown and, if they are still used, food colours associated with hyperactivity in children have to come with a warning on the label.

We have therefore come a long way in terms of more transparent labelling. Labelling gives people a choice, but sometimes it is not enough, as it cannot always be left to consumers to carefully scan the ingredients list to make sure that they are not being duped. The European parliament has, for example, recently banned from use an additive called thrombin, also known as “meat glue”, as it was seen as potentially misleading. It would have enabled meat and fish off-cuts to be bound together to appear to be a single cut or joint, but is something that few people are likely to have thought to look for.

Honest food labelling is therefore absolutely crucial if consumers are to have confidence in the food that they eat and be assured that they are receiving the quality of food that they think they are choosing. This includes making sure that the name of the food is prominent and clearly reflects what people are paying for.

Clear origin labelling
Origin labelling is also an area where consumers can be misled and reflects how difficult it is for consumers to keep up with the reality of a global supply chain. Animals can be moved from country to country, and the meat in the British bacon you buy may have seen nothing
more of the UK than the inside of a factory as the “origin” is legally the place where a product last underwent a substantial change.

A survey by Which? last year found that around eight in 10 people think it is important that the country of origin is labelled on meat and poultry, and around three-quarters of people think so for fruit and vegetables, dairy products, and meat and poultry used in processed foods. Most said they want it shown because they liked to buy British. Besides looking for home-produced food, many people want origin labelling to help judge the quality of the food or simply because they are interested in knowing where it comes from.

There has been some progress as a result of campaigning by Which? and other organisations. Several companies have started to expand the information they provide. The new European Commission food information regulation proposals should also address misleading origin labelling by requiring the origin of primary ingredients to be declared if their origin is different from the origin of the final product. At the moment this is only addressed in voluntary guidance, which is not always followed.

Mandatory origin labelling is also likely to be expanded for single ingredients such as meat, poultry, dairy products, fish and fresh fruit and vegetables, and for meat and poultry when used in processed foods. At the moment, the origin only has to be provided where it would be misleading not to, other than in a few specified cases, such as olive oil and beef.

**Enabling healthier choices**

Clear, honest labelling is also essential when it comes to the nutritional content of what we eat. Foods can often contain hidden levels of fat, sugar and salt – high levels of sugar in savoury ready meals or salt in biscuits, for example.

Incredibly, it is not a requirement to provide any nutritional information unless a claim is made, but most retailers and manufacturers in the UK provide it on a voluntary basis. But while it has been provided, it has not always been used, prompting much debate about how it can become more obvious and more user-friendly.

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3 1,090 adults aged 16+ were questioned face-to-face on 4-8 September 2009. Results were weighted to be representative of adults aged 16+ in Great Britain.
Over the past years, the amount of nutrition information provided on the back of food packaging has steadily increased and generally includes not only energy, protein, carbohydrates and fat but also sugars, saturates, salt and fibre. In the 1990s the food industry developed guideline daily amounts to help interpret the levels against population dietary goals set by government experts. Several retailers started to put these on the label alongside the nutrition information panel on back of pack.

As obesity and other diet-related diseases continued to escalate, attention shifted to highlighting key nutrients on the front of the pack to make the information simpler to interpret and harder to miss. Which?, for example, made the case for this type of approach to the Health Select Committee during its obesity inquiry, and recommended that a traffic light labelling system be developed.4

The Food Standards Agency took this on board, as did several retailers and manufacturers, but unfortunately not in the way that was hoped, leading to many forms of front-of-pack labelling and different levels of interpretation. Research by Which?5 and the Food Standards Agency6 has shown that a combination of traffic light colours, the words “high”, “medium” or “low” and giving the information as a percentage of guideline daily amounts works best. Several retailers and manufacturers have adopted this scheme, but others have yet to do so, instead giving the information just as percentage of guideline daily amounts.

The government cannot require food companies to use a single scheme, as food labelling is an EU competency, and so the debate about how to provide nutrition information is therefore now playing out at European level. Some countries have very limited back-of-pack nutrition information, while others have developed further schemes, such as the Swedish “keyhole” scheme, a type of healthy eating logo. EU consumer organisations want to see full nutrition information on the back of the pack and, crucially, a scheme including traffic light colour coding (and potentially also “high”, “medium” and “low” and percentage of guideline daily amounts) on the front. Discussions around the review of the legislation are likely to continue into 2011.

Ensuring honest claims
Apart from nutrition panels on products, consumers are regularly bombarded with eye-catching claims about the nutritional and health qualities of foods. Which? investigations over the years have shown that consumers generally like claims as a quick and easy way of identifying healthier products, but do not always trust them. EU legislation adopted in

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5 “Healthy Signs?” in Which? (July 2006)
6 Food Standards Agency Comprehension & Use of UK Nutrition Signpost Labelling Schemes (2009)
2006\textsuperscript{7} helped to address this. Nutrition claims such as “low-fat”, which used to be covered only by voluntary guidance, are now defined in law so that they mean the same thing wherever they are used.

Before the new rules, it was up to trading standards officers to challenge manufacturers to show that they could substantiate health claims once they were already on the market. In practice, few local authority trading standards departments would have the resources to do this, and these claims now have to be submitted for independent assessment by the European Food Safety Authority. Following approval by member states, a European Community list will set out the claims that are backed up by science and conditions for their use. But more than 40,000 claims were initially submitted, narrowed down to around 4,000 claims, which are being assessed in batches.

The assessments published to date show that consumers were right to have been cynical, as very few have been scientifically substantiated.\textsuperscript{8} The legislation is therefore finally producing a level playing field, revealing those products that genuinely do have science to back up any claims and ensuring consumers can have confidence that they are not wasting their money on bogus claims.

Importantly, the claims regulation also specifies that nutrient profiles should be developed setting out the levels of fat, sugar and salt contained in products carrying nutritional claims. This is so that products cannot misleadingly suggest they are healthy if the overall product is intrinsically unhealthy, thereby leading consumers to go against government advice by eating it more regularly in the belief that it is good for them.

More sustainable choices
A similar debate to that on nutrition information is likely to play out in relation to the environmental impact of food, but hopefully with some crucial lessons learned. Whether the issue is greenhouse gas emissions, water scarcity, concerns about food waste or deforestation, it can be very difficult for consumers to make informed, sustainable choices, even if they want to. The issue is particularly complicated because, unlike with nutrition advice, the actions that we need to take to minimise our impact are not that straightforward and the evidence base is still emerging. It is

\textsuperscript{7} Regulation (EC) 1924/2006 of the European Parliament and Council of 20 December 2006 on nutrition and health claims made on foods
\textsuperscript{8} www.efsa.europa.eu/en/nda/ndaclaims.htm
even hard to give broad rules of thumb, as the environmental impact is likely to vary according to the particular supply chain.

Environmental labelling is, however, a political priority and an area of increasing interest to consumers. It is therefore important to find a simple, easy-to-use form of labelling that enables people to make more informed choices. As experience from nutrition labelling also tells us, it is essential that as people become more engaged with issues of sustainability, they be not duped by misleading claims.

Several labelling schemes are already on the market, covering different elements of sustainability. Some of these, such as carbon footprint labelling, give consumers simple, basic facts. Organic products have been on the market for many years, covered by specific EU legislation and overseen by independent certification bodies, bringing together a range of social, ethical and environmental criteria. But many other schemes are now in use – from retailers’ own schemes such as Tesco’s “Nurture” range, to other independent certification schemes like the Rainforest Alliance label, now found on a broad range of products, including tea, coffee and chocolate, and the Marine Stewardship Council scheme indicating sustainably sourced fish.

A particular difficulty is that sustainability can mean many different things. Fairtrade foods have been selling well, despite the recession. At the same time, there has been a drive to buy more locally produced foods to support UK producers. Certain aspects of sustainable food systems, such as food safety and animal welfare standards, also tend to be taken as given. The challenge is to provide clear advice and actionable information to consumers, which enables them to act on a range of factors without having to make unfair trade-offs. Existing schemes need to be clear and transparent so that consumers understand exactly what they are buying and there is scope to go further.

Initial research by Which? indicates a low level of awareness of the issues and of existing labelling schemes, with the exception of Fairtrade. The messages are, however, very similar to those for nutrition labelling. People want clear, user-friendly information that can be trusted, in an obvious place that puts the information in context.

Use of new technologies
The role of new technologies, as part of strategies to enhance what we produce in a way that minimises the environmental impact, remains contentious. For some, new technologies have a fundamental part to play in tackling today’s food security challenges; for others, they are the antithesis of sustainable, lower-impact food production systems. Being able to make an informed choice is therefore crucial.
In the 1980s, it was food irradiation that was the focus of concern, resulting in a requirement for labelling and approval of irradiated ingredients. In the 1990s, genetic modification (GM) made many people realise just how complex food supply chains can be. Nanotechnologies and cloning are the latest emerging technologies that preoccupy policy makers, while many consumers are unaware of their potential impact on food.

The Food Standards Agency is conducting a GM debate in order to try to understand the complexities and where GM fits into the food sustainability agenda, although this in itself has proved to be very controversial, with differing views on how it should be approached when the issue is so highly charged. EU legislation requires GM-derived ingredients to be labelled, and many retailers and manufacturers have non-GM policies, although the increasing cultivation of GM crops globally makes this a challenge.

The food industry has said that it wants to learn from the mistakes of GM foods when it comes to nanotechnologies. These could bring many benefits, from improved nutritional and quality characteristics to longer shelf life and more environmentally friendly food packaging. But there is little information publicly available about the status of developments, which is likely to fuel suspicion and hamper the development of the technology into areas that have real potential. The House of Lords Science and Technology Committee, for example, has expressed concern at the food industry’s reluctance to speak out about developments because of a fear of the public’s reaction.

A Which? citizens’ panel indicated that consumers expected “nano” ingredients to be shown on foods, backed up by broader information about what the technology means. EU legislation now requires nano ingredients to be listed on cosmetics, so it would be unreasonable if consumers did not have this information on foods. Which? has called for their labelling as part of the EU food labelling review, and there is support from the European parliament for their identification in the ingredients list.

• More contentious is the issue of animal cloning. Research by Which? has shown that few consumers would want to eat the products of clones. Just 13% of those interviewed agreed that cloning should be used to produce animals

9 House of Lords Science and Technology Committee Nanotechnologies & Food (2010)
10 Opinion Leader Research conducted a citizens’ panel on behalf of Which? with 14 members of the public. Panellists were selected broadly to reflect the general public and sat for three days in Birmingham from 29 November to 1 December 2007.
11 1,968 members of the public, representative of the general population of the UK, were interviewed by telephone in February 2008.
for food production. Eighty per cent would prefer to buy foods not produced using clones, and 91% thought foods produced using clones should be clearly labelled. An EU proposal to deal with clones and their offspring is expected later this year and is also being looked at as part of the EU’s review of novel foods legislation.

- Whether in response to concern about ethics or broader social concerns, informed choice about the use of new technologies is therefore essential if consumers are to have confidence in food. Labelling is not, however, a surrogate for effective controls over safety, and neither is it the solution to enabling choice. It is an important tool that needs to be backed up with broader communication and regulation if choice is to be meaningful.

**Conclusion**

Food labelling therefore continues to be the primary means through which people find out what they are eating. It is encouraging that the government is emphasising honest labelling. Together with the on-going review of legislation at European level, this provides an opportunity to ensure that food labels provide essential information, presented in a way that is clear and easy to understand. There are several areas where greater openness and honesty is still needed. These include making sure that consumers are not misled by the quality of the products that they buy, that it is easy to find out where and how food has been produced, and that it becomes much easier for consumers to make healthier, more sustainable food choices.
Chapter 9

Food and ethics

Nick Mathiason, Media Consultant at the Fair Trade Foundation
Food and ethics

In the bubble of wealth and economic opportunity largely restricted to Europe, North America and Australasia, politicians, business leaders and large swathes of the population over the past 30 years have regarded the abundant availability of low-cost food almost as an inalienable right. This historically unique situation was no accident. Policy makers, food companies, agri-giants and supermarket bosses in advanced economies appeared willing signatories to a pact that, if not Faustian, has had hugely damaging consequences for huge sections of the global population and the environment.

Once the post-Second World War policy objective that prioritised security of food supply was met (which in turn triggered lavish government financial support to farmers in the form of subsidies and tariffs), a new phase began. It entailed taking the inflationary sting out of food. This is why governments, particularly in the UK and the US, encouraged the accelerated proliferation of giant out-of-town and edge-of-town supermarkets where cars park for free, in contrast with town centres, to the point that today in Britain, supermarkets account for over 75% of grocery spend.

Ever-rising supermarket footfall translated into increased market share, encouraging economies of scale and the nirvana of cheap food. To satisfy this beast, food, like other strands in the economy, became “commodified”. Aggressively efficient supply chains featuring an ever-dwindling number of food manufacturers and processors fed giant supermarkets that in turn controlled ever-increasing tracts of land to build an ever-increasing number of outlets. Amid the uber-industrialisation of supply chains and sales, the industry has been effectively “financialised”.

Capitalism on steroids

In 1989, when KKR, one of the world’s most powerful private equity firms, bought food giant RJR Nabisco for $31 billion – a record price for a takeover that lasted for 17 years and was immortalised in the book Barbarians at the Gate – it confirmed the coming of age of a new form of capitalism on steroids.

Powerful financial engineering firms placed one-way bets by borrowing money cheaply (receiving generous tax breaks in the process) and committed minimal amounts of their own cash to finance takeovers. Private equity has feasted on the food sector. Companies like Bird’s Eye, US Foodservice and Leaf, the Dutch confectionary manufacturer, are among the dozens of food manufacturers that have fallen under their control.
The result has been a ruthless pursuit of "efficiency savings" that has coloured the entire food sector. The new paradigm created a driving down of terms and conditions for food suppliers and workers, and the wholesale relocation of business functions to places where, more often than not, wages are cheaper and labour rights are derisory.

This, together with modern farming methods, all helps explain why over 40 years, tea, coffee, cocoa and sugar have all seen huge falls in prices – of 60%, according to the UN Food & Agriculture Organization. Consolidation in the food industry, plus the tougher terms demanded by supermarkets and the financialisation of food, placed huge emphasis on the long-term decline in food prices in real terms.

And so a situation emerged in which the weakest, lowest members of the supply chain bore the brunt of the drive for market share and low prices to consumers. It is a situation that has largely continued unabated. Most of the money from the cocoa trade, for example, is made after the beans have been processed, notably from chocolate. Growers in the West African nations of Cote d’Ivoire and Ghana, which combined account for around 70% of global cocoa production, do not have access to funds with which to build processing facilities.

Developing country farmers are likely to receive just 3.5% to 6% of the value of a chocolate bar, compared with 18% in the late 1980s. By contrast, the share of profits for the manufacturers has increased from 56% to 70%, and for retailers from 12% to 17% over the same period, according to a study by Agritrade.

In areas where the northern hemisphere competes with the developing world, huge subsidies enjoyed by European and American farmers – through the €52 billion Common Agricultural Policy and multibillion-dollar payments doled out to US farmers, respectively – place a further downward pressure on world prices. This is because the biggest Western agri-businesses can sustain cheap prices. Especially as government support to farmers in OECD countries, which goes mainly to the most powerful farmers, equalled $258 billion in 2007 – nearly a quarter of their revenue.

So rich nations' farmers beat their counterparts in poor countries on margin and have more cash to invest in their business. True, this has played a part in raising agricultural productivity, which now generates 17% more calories per person than 30 years ago, despite a 70% population increase, according to the Food & Agriculture Organization. But market prices of stable foods have fallen by close to 60% in real terms since 1960.
Place all these ingredients in the pot and the dish served has become unpalatable for a sizeable section of Western consumers, particularly in the UK, which remains the ethical shopping capital of the world.

The threat of climate change
A growing scepticism – or existential anxiety – at the onward and relentless march of unfettered, deregulated liberalised economics has met an equal force: the increasing awareness of the threat climate change poses to future generations.

Food accounts for a fifth of the UK’s consumption-related emissions of greenhouse gases. But this rises to a third once indirect emissions from global land use changes such as deforestation are taken into account. Irrigated agriculture is the world’s biggest water user, accounting for about 70% of water. Thousands of species are threatened by agricultural expansion and intensification.

The flames of ethical consumerism have grown as a stubborn reaction to the power of corporate power within the food industry. They have been fanned by unions, campaign groups, church groups and voluntary organisations that have pioneered alternative business models, which draw on mutual and co-operative traditions. Companies such as Divine – a Fairtrade social enterprise, 45% owned by a Ghanaian cocoa co-operative, that has become a leading UK chocolate brand – have shown the way.

But just as concern over the developing world’s workers has risen, so has the public’s desire for locally sourced food, fed by the plight of British farming. The dairy industry has been badly hit. Each week, nine dairy farmers in Britain are forced to sell up. In the industry’s heyday, there were 28,000 dairy farmers in England and Wales. Today there are fewer than 11,000, making on average £20,000 a year. This has led to increasing calls for supermarkets to give a fair deal to British farmers.

All these factors have led to interest in food miles, the development of farmers’ markets and independent food companies. And just as the process that delivers food to our plates is become increasingly mechanised, the public’s new-found interest in cooking and gardening has risen markedly. Today, there are 100,000 people waiting to get an allotment in Britain.

The trend for supermarkets to create smaller, more convenient store formats has also focused attention on protecting independent shops. An alliance between influential think tank the New Economics Foundation and green campaign group Friends of
the Earth has stoked media interest in the issue and provoked strong parliamentary reaction across the political divide.

**The ethical consumer sector is burgeoning**

The slow burn of consumer disenchantment has gained momentum in recent years. One of the most successful ethical labels has unquestionably been Fairtrade, whose distinctive mark now has a recognition factor by the public of 90%. Other certifications, including organic, the Rainforest Alliance, cruelty-free or carbon-reduction labels and free-range products, have all blossomed, creating a distinct sector.

Today leading businesses ignore human rights, environmental protection and pay and conditions issues at their peril. Failure to abide by the spirit of protocols and laws can exact a hefty price. Research this year commissioned by the Fairtrade Foundation shows that one in five British consumers punish socially irresponsible companies through their shopping choices. And within the committed Fairtrade consumer sector, this rockets to more than two-thirds, who say they always or often punish companies for not being socially responsible.

The carrot comes in the shape of huge brand loyalty for companies that make a point of doing the right thing. In fact nearly a third of consumers, according to a poll of 1,500 consumers undertaken by Globescan, are likely to reward companies for being socially responsible. Last year the Co-operative Bank’s research found that 64% of UK adults avoided a product because of a company’s behaviour, while 52% claimed to have bought a product for ethical reasons.

These findings confirm a solid appreciation of ethical issues within the UK and yield proof that placing sustainability – whether paying a fair price to farmers in the developing world for commodities or reducing a firm’s environmental footprint – has paid huge dividends. And for many companies, the need to secure sustainable livelihoods for suppliers overseas has moved from the corporate social responsibility niche into core business practice.

The Co-op and Sainsbury’s supermarkets have recorded sector-beating growth since scaling up their work with Fairtrade. The Co-op was the first UK retailer to sell Cafedirect coffee, convert its own-brand chocolate and coffee to Fairtrade and sell Fairtrade wine. Its strategic decision to sell as many Fairtrade products as possible is by no means a direct reason for it becoming the fifth force in British supermarket retailing; but the Fairtrade shift played a part, by tapping into UK shoppers’ sense of
justice for producers in the developing world.

Likewise Sainsbury's, under the leadership of Justin King, has shifted all its own-brand bananas, sugar and tea to Fairtrade. Not only did the move transform the fortunes of communities in some of the world's poorest countries, it coincided with Sainsbury's sales growth through a recession. And in bananas, Sainsbury's shift to Fairtrade saw an overall significant sales rise.

Ethical consumerism is now part of the retail mainstream. And Fairtrade is leading the charge. Retail sales in the last 12 years have risen from £16 million in 1998 to £800 million in 2010. True, the UK's overall grocery sales top £120 billion. But against all market predictions that Fairtrade would only be a temporary fad, the sector year-on-year posts sales growth that far outstrips that of the conventional market. Furthermore, Fairtrade has become a gateway – a point of difference – for major brands, in a way that delivers huge financial and reputational benefits.

**Profiting from a clear conscience**

Within the Fairtrade movement, there is growing evidence that companies and brands that become Fairtrade-certified more often than not see sales and reputational uplifts. Marks & Spencer, one of the UK's biggest food retailers, has committed to sourcing Fairtrade cotton and food goods as part of its Plan A mission aimed at reducing its carbon footprint and becoming a fairer business partner to its suppliers. This policy seems to be born out of enlightened self-interest; and it shows signing of gaining traction.

Marc Bolland, the dashing Dutch executive who began his tenure as Marks & Spencer's chief executive in May, had planned to wait until the autumn to reveal his strategy for the firm. But 40 days into his job – three months before outlining his grand plan – the first clue to his vision that he granted investors, analysts and journalists was not about profit projections, store openings or employee headcount. Instead, Bolland maintained he would commit the company to its ambitious ethical procurement and carbon reduction programme. Cutting waste, using alternative fuels and paying suppliers in the developing world a fair price were issues that Bolland would ensure were at the heart of M&S's business strategy.

ING Equity Markets Research has stated:

*Companies can reap profits from consumers’ social and environmental concerns and the understanding that resource scarcity will result in a permanent change to*
business models. In our view, the third industrial revolution will on the one hand save the planet and on the other accommodate the consumer explosion we expect in the coming decade.

For today's companies, there is increasing scrutiny of how they and their suppliers conduct themselves. In early 21st-century Britain, consumers are easy meat for a hungry media beast constantly ravenous for new morsels.

Sweatshop abuse stories vie with health or environmental scares associated, for example, with pesticides or unthinking waste. And the ethics on which our consumer society is based were brought to the attention of a young demographic, thanks to one of the most innovative documentaries of the past year. Screened on BBC3, Blood, Sweat and Luxuries was a four-part series that took a group of young British adults to Africa, where they lived and worked in poverty producing leather handbags, coffee and other staples. So successful has the show been that the hunt is now on by rival production companies to come up with copycat ideas.

The providers of food grapple with new demands, with varying degrees of success and enthusiasm. Some make a virtue of paying workers decent wages; others are more preoccupied with environmental issues, which has the useful side effect of saving huge amounts from corporate energy bills. Others still make a point of doing nothing other than either just guaranteeing low prices or a quality product.

But for all companies, there is now no hiding place. Smartphone technology is satisfying the growing demand for food traceability. A new iPhone application, the Good Guide, assesses over 65,000 products, including food and household products, for provenance.

Numerous websites are assessing companies for their social and environmental credentials. One of the best is seewhatyouarebuyinginto.com, which puts companies through a rigorous appraisal before allowing a firm to become accredited.

Pressure builds from all sides
And yet all this can place huge demands on business. A joint report by the Organisation for Economic Co-operation & Development and the UN’s Food & Agriculture Organization on 10-year agriculture commodity projections, published in June 2010, warned that the growing consolidation of the food industry was a worrying trend, while smaller players could be facing increasing costs as a result of requests to prove environmental or social credentials.
The report stated:

*The food industry is becoming more vertically integrated, globalised and concentrated. These developments have enabled the industry to respond well to a wide range of changing consumer preferences, while maintaining relatively low prices. However, there are also concerns about their growing market power, about price transmission, transparency and what is a “fair” distribution of profits across the food chain. Both public food safety standards and private quality standards have been raised in response to consumer demands, but these imply higher compliance costs and some farmers, particularly in developing countries, may have difficulty in meeting the more stringent standards.*

Consumers feel powerless, unable to affect the big picture, locked into high levels of consumption. And they want competitively priced goods, but not at any cost. This is why small purchases of ethical products salve consciences. It should not be forgotten that while ethical consumerism is associated with the middle class, Fairtrade, for instance, increasingly has a substantial following among lower-income groups.

But undoubtedly, the big question is whether in a darker future – one in which supply constraints spark higher food bills – ethical concerns are sacrificed. So far, the consumer signals are mixed. It could be argued that we are yet to feel the full force of the bust. That said, overborrowed British shoppers have remained resolutely committed to Fairtrade, though there are signs that organic sales have fallen.

In the building debate over whether the era of cheap food is over, one way of understanding the issue is that food has always cost around the same to produce. It is just that poorer people and the environment have been forced to accept rougher treatment and reduced terms. But it does not have to be so, even in times of austerity. Global companies like Starbucks and Cadbury, which have embraced Fairtrade, have shown it is possible to retain big profits while still ensuring benefits flow back to growers.

It is arguable, then, whether the assertion that the cheap food era is over is necessarily axiomatic. It is perhaps more a case of food giants taking slightly less value out of the supply chain. But there are signs that global companies, who drive down margins to boost profits and ensure consumers are protected from rising commodity trends, could reassert themselves.
In an era of a rising global population, high energy prices, water stress and climatic uncertainty, the fear is that just securing supply will be all that matters. How that supply is secured could be a secondary matter – not so much land grabbing as food grabbing.

As we enter a period of economic austerity, a squeeze on the public sector and higher taxes, it's all the more important that ethical treatment of suppliers and environmental considerations are genuinely now a no-compromise requirement rather than the optional luxury they were seen to be 10 years ago. If not, the future could be part Malthusian and part Hobbesian – brutish, nasty and hungry.

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