feeding Britain

Edited by Dr John Bridge and Nick Johnson

THE SMITH INSTITUTE

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This timely publication examines the often overlooked issue of food production and security in Britain. At the global level, population growth, economic growth in key emerging countries, changing dietary patterns, finite land availability, climate change, challenges to the availability of key resources, the energy challenge, and a slowdown in the rate of growth of food productivity all point towards the need for new thinking. We tend to think of these issues in an international context, but in a globalised world they will inevitably affect the UK.

The Smith Institute thanks Dr John Bridge (chairman of the Agriculture & Horticulture Development Board) and Nick Johnson (research fellow at the Smith Institute) for editing this collection of essays and gratefully acknowledges the support of the Agriculture & Horticulture Development Board towards this publication and the associated seminar.

Published by the Smith Institute

ISBN 1 905370 46 6

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Foreword

Rt Hon Hilary Benn MP, Secretary of State for Environment, Food and Rural Affairs

We live in a world where a billion people are overweight and a billion go to bed hungry every night. A world where a child dies every five seconds from starvation or malnutrition. A world where the entire international food aid programme amounts to only a fifth of what a single developed nation throws away in a single year.

Last year saw riots over food prices, bans on exports, and armies being mobilised to bake bread. The UN's Food & Agriculture Organization reported that another 40 million people had been pushed into poverty and hunger across the world.

In the UK our food supply remains secure, and in fact we enjoy a larger choice of foods than ever before. But we also felt the impact of increased prices last summer, and although they are now falling again, these events gave us a glimpse of what is to come if we fail to act.

Over the last 50 years food production has outstripped population growth and, over the long term, prices have come down. But such intensive production comes at a high cost to the environment. Global population is now heading for 9 billion by 2050, and food production will need to double just to meet demand. We have the knowledge and the technology to do this as things stand, but the perfect storm of climate change, environmental degradation, and water and oil scarcity, threatens our ability to succeed. If we are going to continue to prove Malthus wrong, then increases in food production will have to be sustainable.

In the UK, we have an opportunity to show what a sustainable and productive food system can achieve. Our farmers and food manufacturers make a huge contribution to both our food security and our economy. Despite the wet weather, our farmers brought in a record wheat harvest last year. Beef and veal exports nearly trebled. Our food system once again proved itself resilient to challenges, and I want it to continue to produce as much as it can – the only conditions must be that production is sustainable, and that there is a demand for what is produced.

But, ultimately, there can be no UK food security without global food security. We must recognise, as the chair of the Council of Food Policy Advisers, Dame Suzi Leather, writes: "things have changed". There are some really big questions that we need to answer, taking account of the global context. How can we ensure that consumers continue to

have access to safe, nutritious and affordable food? How can we ensure that our food supply is reliable and resilient to global shocks and crises? How can we ensure that the way we produce and consume our food is helping us to meet the challenges of tackling climate change and securing a healthy environment?

As we get to grips with these questions, this monograph is a welcome and important contribution to the debate.

Introduction

Dr John Bridge, Chairman of the Agriculture & Horticulture Development Board

Given the unprecedented uncertainties in the global economy at the present time, the range of challenges we all face are stark, complicated and, probably, not amenable to simple solutions. One such set of challenges surrounds the global economy, population growth and the capacity of the world to feed itself in the medium to long term. The core challenge is clear but complicated, its resolution depending on a number of key variables, which in their own way are extremely difficult to reconcile. In short, all our basic assumptions will be challenged.

Here is the challenge. At the global level, long-term population growth, economic growth in key emerging economies, changing dietary patterns, finite land availability, climate change, the continuing availability of key resources (notably water), the energy challenge (including the competition between crops for biofuels and food), and a slowdown in the rate of increase of food productivity and level of food stocks all point to the simple fact that we can no longer take food for granted. This core challenge – how we feed ourselves in the future – points to the need for new thinking, new policies and possible changes in existing international institutions in order to meet what is generally agreed to be a very serious challenge to the global food economy.

By 2050 it is estimated that the world's population will have grown by 50% – from just over 6 billion today to over 9 billion. Over 40% of that growth will occur in just two countries, China and India: two of the fastest-growing economies in the world. To meet this overall population growth, it is generally agreed that world food production will need to double. With continuing economic growth – even taking into account the current slump – per capita incomes, even in the world's poorest countries, will grow.

To take just two consequences of this: in 2008 only 350 million people in the world had disposable incomes in excess of £8,000; by 2030 this figure is likely to rise to 2.1 billion. In 2008, it was estimated that 2.7 billion people lived on £1 per day. Once individuals move to a daily income in excess of £5, they not only begin to demand different foods, but also processed and packaged foods. Rising incomes also bring about a broad shift in diets, from ones based on carbohydrates to ones with a higher protein content. Of course, to produce more protein-based foods requires a greater input of animal feedstuffs.

Conflicting challenges

This key challenge is linked to five interrelated and conflicting issues. The starting premise

is that more food is likely to require more land. More land use and more agricultural inputs increase greenhouse gases; climate change restricts the useable land area; there is demand for alternative uses for land (urban development to accommodate the increase in population, for instance, and the need to preserve rainforests and grassland habitats); and increasing use of agricultural products for non-food uses (biofuels being the obvious example) increases pressure on prices.

Examining one of these issues in more detail, agriculture generally and specifically in the UK is a major contributor to emissions of greenhouse gases. Seven per cent of UK total emissions are attributable to the agriculture, forestry and land management sectors – a similar level to the aviation industry – but the sector contributes 38% of methane emissions and 68% of nitrous oxide emissions. The livestock sector alone (sheep, pigs, poultry and cattle) accounts for 3.1% of all UK emissions, based on 2006 data.

Whilst the agricultural sector is not included in the first three greenhouse gas budgets recently announced by the Committee on Climate Change, there will be immediate pressure on the sector to introduce mitigating measures to reduce the carbon footprint of food production. So there will be pressure to use less land rather than more, fewer fertilisers, more effective watering and irrigation systems, and alternative feed stocks for animals that reduce greenhouse gases, and to take many other actions. Certainly by 2050 the sector will need to make a full contribution to the 80% reduction in emissions required by government policy. And this is only one of the issues facing those wishing to secure a stable and sustainable food supply for the UK in the long term.

Research now being undertaken by Chatham House on future global food scenarios sees very little support for the "business as usual" scenario. Instead we need to look at how overall economic growth, world oil prices, food stocks and food prices interact. The four future food scenarios that have been analysed by Chatham House give varying degrees of comfort or discomfort as regards the ability of the world to feed itself in an adequate manner by 2050, but within all these scenarios is an underlying issue of volatility. The broadly stable food prices over the past decade linked to adequate food supplies and food stocks are things of the past (global grain stocks currently only guarantee 40 days' supply); the future promises far more insecurity and uncertainty and almost certainly higher average prices for the foods we consume – linked generally to availability, but more specifically to energy and commodity inflation. Unfortunately, in the short term rising food prices will push more people towards starvation.

Faced with these uncertainties, a national response may well be to try to secure more food from domestic sources, a drive to become more self-sufficient. Today, about 60% of all our

food needs are met by domestic production. The figure was in the 40-50% range in the 1950s and 60-70% in the 1980s, so it is difficult to define what would be an appropriate figure for the future. Equally, if all major food-producing nations took the view that self-sufficiency was the route to take, this would lead to a major collapse in world trade, clearly to the detriment of the poorer nations in the world.

However, food security is much more about identifying, assessing and managing risks associated with food supply, rather than simply trying to create a greater degree of self-sufficiency. Where the risks are highest, mitigating action can be taken to internalise some of these risks. What does seem likely is that in the medium to long term we will be asking our domestic industry to produce more rather than less, but to do this on a given footprint in terms of land, and reducing where possible key inputs – water and fertilisers, for instance.

The economic context

We also need to look at food in a different context. Today primary agricultural output contributes less than 1% to GDP, but looked at as part of the total food chain – agricultural production, processing, distribution and retail – describes a sector generating over 7% of GDP and responsible for 14% of employment. Food processing is now the largest manufacturing sector in the UK. So increasing domestic food production is not just about securing a stronger base for meeting the needs of our own population and contributing to greater stability in world food supplies, it is also a key driver of the UK economy.

The analysis so far indicates that there are some extremely difficult issues for the British economy to resolve. But not all is bad news! Shifting weather patterns, with more aridity and heat in Southern Europe, have led to the view that Northern Europe, and more specifically North-western Europe, could well become the "breadbasket of Europe" and a major contributor to world food output. Relatively good weather conditions will clearly help in realising this opportunity, but must also be harnessed to long-term research and development programmes that seek to improve productivity and efficiency and, specifically, lead to higher-yield crops.

Genetically modified organisms clearly need to be researched and tested for commercial exploitation. GM organisms are part of the commercial production system in both North and South America, and it is clearly important that the EU responds accordingly, to avoid, if nothing else, a "backdoor" flow of GM products through the use, for instance, of imported soya beans. The technology challenge is significant, but dismissing technologies that have the possibility to significantly improve crop yields could have significant long-term consequences.

There are some important responses needed to the challenges outlined above, at a personal, community and national level. It is clear, looking into the near and distant future, that we cannot take food for granted. Robust and open trade regimes will still allow the UK to trade with the rest of the world and source the food we cannot produce, but the strong challenge of "food miles" alone should encourage more local production, although it may, in the long run, reduce choice.

Consumers may well need to shift their preferences. Land management in its widest sense will become increasingly important and will require a wide range of interests in the land-based sectors to come together to work to secure sustainable long-term solutions, which allow for increases in food production but ensure that the resources needed to support this increase do not have negative impacts elsewhere in the economy.

Not all is doom and gloom; the review of the key agricultural and horticultural sectors suggests that there is still potential to increase food output within current technical constraints and scientific knowledge. Developing a new technology paradigm, however, is probably the biggest challenge, as it not only involves the introduction of novel and possibly contentious techniques but also requires the science to be acceptable to the consumer.

Feeding Britain in the future will be challenging. There is evidence that the resources, knowledge and commitment to meet this challenge do exist. Harnessing them to allow us to increase output at the same time as meeting targets for environmental sustainability will not be easy. It will call for a level of collaboration across industry, consumers and government that has not existed to date, but the challenges we face do require radical action.

Chapter 1

The role, challenges, opportunities and priorities for the Council of Food Policy Advisers

Dame Suzi Leather, Chair of the Council of Food Policy Advisers

The role, challenges, opportunities and priorities for the Council of Food Policy Advisers

For anyone working in food policy over the past 30 years, the challenges have essentially been food safety and consumer information. Agricultural production has been taken for granted; we did not worry about levels of self-security. We had a food retail sector that was highly adept at delivering a cornucopia of choice, at ever more competitive prices. The proportion of our income spent on food dropped, the amount of time we spent preparing food dropped; our subjective experience of food security was that we had never had it so good.

Things have changed. The importance of food policy has increased in the minds of both consumers and politicians; driven by different factors at different times. From a desire to make more informed choices, to concern about nutrition and health; from understanding the impact our food has on our environment, to experiencing the impact our choices have on our bank balances. And although any one of these may be the focus at any one time, they are intrinsically linked.

So, why this change in emphasis? Aren't the market, current governmental structures and established policies demonstrably taking care of our food needs?

In many respects, yes; although there are huge global problems. One billion go hungry, while in contrast the UK and other developed countries have growing obesity problems. But the real reason food security is on the agenda now is the recognition that the world is changing profoundly in terms of the global demands on the food system and the system's ability to meet those demands. Even in countries like the UK, where we have essentially regarded food as a private good, government is increasingly concerned about food security.

This is partly because something is happening to the food supply. By April 2008, global food prices had risen 83% over the previous three years,[1] driven by high income growth in emerging economies (especially China), poor harvests (Australian drought), use of crops for biofuels (such as maize for bioethanol), high energy prices (and hence fertiliser prices), the relative inelasticity of supply, historically low food stock levels and some speculative investment. And although food prices fell later in 2008, the cost of staples was still 28% higher than in 2006, a change that meant that between 2007 and 2008, 40 million more people joined the ranks of the starving.

1 Evans, A *Rising Food Prices; Drivers & Implications for Development*, Chatham House briefing paper (Centre on International Cooperation at New York University/Chatham House Food Supply Project, 2008)

But an important additional driver of concern about food security is the evidence of climate change.

The planet is warming because of anthropogenic fossil fuel emissions. Agriculture contributes to climate change, and climate change adversely affects agriculture. Globally, the potential for food production is projected to rise as local mean temperature increases over a range of 1-3°C, but above this it is projected to decrease. At the same time there will be decreasing water availability and increasing drought.

Alongside these (unpredictable) climate changes, the World Bank estimates that demand for food will rise 50% by 2030, owing to rising affluence and growing world population.

Taking population growth and climate change together, we are in the next 20-50 years going to have to produce twice as much food, on less land, using fewer inputs, employing fewer people, using less water, while fighting against less biodiversity, higher temperatures, changing rainfall and more frequent droughts and floods. To do this requires food system planning on a scale unknown in the history of the world. It is difficult to construct a realistic scenario in which the availability and price of food prices is not profoundly affected. It is hard to see how stability will be achieved.

The likelihood that supply will fail to match demand will certainly lead to very significant global justice challenges. Already the effect of growing demand for meat and dairy products has seen an increase in the relative cost of staple goods to the poor. And this focus on food security must also make us question the extent to which, even now in a country as rich as ours, household food security can be taken for granted.

What do we mean by food security?

The presence of food supplies in a nation, or region, is no guarantee of food security if households lack access to them. For the right to food to have a meaning, it has to be considered at the level where food is actually consumed. Household food security depends on a household's "access to a basket of food which is nutritionally adequate, safe, and culturally acceptable, procured in a manner consistent with the satisfaction also of other basic human needs, and obtained from supplies, and in ways, which are sustainable over time".[2]

Addressing the challenge

This is not easy. Climate change, availability, affordability and health in relation to food pose extraordinary challenges, from the local to the global level. Clearly, the government

2 Eide, A, Oshaug, A and Barth, W "Food Security and the Right to Food in International Law and Development" in *Transnational Law & Contemporary Problems*, vol 1, no 2 (1991), pp416-467

is taking this very seriously, right from the top.

To help address this challenge and ensure it gets the attention it requires, environment secretary Hilary Benn has set up the Council of Food Policy Advisers – a group of experts brought together at an auspicious time to achieve something quickly.

Covering food production, supplies, prices, distribution, consumption and related aspects of food policy, we are made up of 15 individuals who have a rich and wide expertise in the food system, from farming and the farming community, sustainable production and sourcing, food businesses, retailing, public- and private-sector catering, regulation, science, the third sector and the consumer.

The council needs to move beyond the description of the problem into practical solutions. Deciding the right policy aims, bringing together the various conflicting pressures and goals, identifying the right levers for change (fiscal, price, education, training, regulation and so on) and the most appropriate level of action (such as local, national or EU).

We have already identified a set of priorities that need to be addressed in order to start tackling this enormous issue.

1. Identifying what a healthy, sustainable diet is and how accessible and affordable it is:

- How can it be sourced at a national level, once a 2-5°C rise in temperature, a reduction in water and less land are factored in?
- How does it relate to the economy and disposable income, and how do we make it happen on the ground?
- What are the barriers to its implementation?
- How does it fit with the change in consumer and business behaviour following the economic downturn, and do we have the right skills in place to achieve it?

2. Communicating the benefits of a healthy, low-impact diet:

- developing a model to allow individuals to make informed choices at the point of sale;
- having a tool to help navigate through complex and conflicting issues;
- moving people towards this diet in order to make a significant impact on health and the environment;
- identifying the impact on production and policy; and
- mapping out the route of engagement for those without the experience or knowledge and with limited incomes.

3. Procurement:

- engaging government with the model;
- establishing public provision, following the diet that is mapped out; and
- making a decision on compulsory, rather than voluntary, models of procurement.

Working through these issues will present significant challenges. It has taken a shamefully long time to recognise the reality of climate change, and even longer to recognise the reality of modern malnourishment. The further away we get from being able to meet our basic food needs, the more we ignore our basic nutrition requirements. In addition, those policies used to encourage increased food production in the UK will need to be different from those used in Africa. There is no one-size-fits-all approach.

Nutrition is a basic need, but food is a private good and easily marketable. In some less developed countries, government intervenes to ensure food security by adopting targeted food subsidies (for instance, through nutritional supplementation), food (or cash) for work programmes, or credit facilities. In the UK we have seen standards play an important role (school catering), sometimes subsidised access to food (again school catering) and more recently, food vouchers for low-income pregnant women. But is this enough? Despite the World Bank's recognition that pre-conceptual care is a golden opportunity, the UK's 15- to 35-year-olds have the worst diet of all age groups.

The council does have a challenge. Food security, health, climate change, the credit crunch and food safety (to name but a few) – all brought together, all requiring attention, all needing to be factored in. It is not easy, but it is necessary, and if we get it right now then we will be one step nearer to achieving a sustainable, secure and safe food supply for the British population in the years to come.

Chapter 2

The UK food situation

Introduction

Stephen Rossides, Head of the Economic & Policy Analysis Group at AHDB Meat Services

This chapter of the monograph looks at how individual sectors of the UK agriculture, horticulture and fishery industries might realistically respond to a challenge of significantly increasing output in an environmentally sustainable way, given finite land and sea resources, and on the basis of existing knowledge.

The chapter comprises contributions from the six sector organisations within the Agriculture & Horticulture Development Board – BPEX (pigs), EBLEX (cattle and sheep), HGCA, the Horticultural Development Company, DairyCo and the Potato Council – as well as the British Poultry Council and the Sea Fish Industry Authority.

The specific circumstances, market conditions, technical constraints and particular economic and policy drivers differ from sector to sector. But there are also themes and issues that are common across the sectors, which emerge from the individual discussions.

In some sectors (such as pig meat, beef and sheep meat, and horticulture), the level of the UK's self-sufficiency has fallen – in sometimes cases quite considerably – over the years. In some instances, this may be due to external shocks to the system (for example, animal disease outbreaks and their lasting impact in some of the livestock sectors), policy changes and/or other market pressures, sometimes leading to low producer profitability and lack of investment over a protracted period. While, as the government argues, self-sufficiency may not be a complete measure of food security, the reasons for falling self-sufficiency are surely worthy of reflection.

In some cases – for example, sea fish, and to some extent in the potatoes sector – the scope for exploiting existing food resources may partly lie in encouraging changes in consumer habits and tastes.

The discussions strongly highlight the continuing need for innovation, based on the fruits of strategic and applied research and its practical application in order to meet new consumer requirements, tackle existing and emerging plant and animal disease problems, reduce costs and, of course, increase productivity.

With falling rates of productivity growth – most notably in the cereals sector – and, looking forward to the mid-21st century, the challenges of population growth, climate change and growing pressures on natural resources, it is important to bear in mind the time lag

between the beginning of new research and its readiness for practical application. There is very substantial concern in many quarters in the UK about the falling commitment to strategic research on the part of government over many years.

The discussions also highlight the potential role of biotechnology, including GM technology, in increasing production and productivity.

Maximising efficient use of inputs and resources, effective knowledge transfer, attracting and retaining skilled labour, training, and attracting new entrants into sectors where the age profile is a matter of concern are key challenges and major opportunities for the sectors to realise their potential.

In most cases, the primary responsibility for responding to these challenges and opportunities lies within the industry itself. But equally, in most cases there are other steps that government, in collaboration with industry, can do to help: for example, through better regulation, by facilitating better relationships in supply chains, by improving access to and the use of rural development funds to promote competitiveness, and by generally championing and encouraging a farming industry that is increasingly part of the solution to problems, rather than a cause of them.

In most of the sectors, however, there is substantial potential for increases in production and productivity even on the basis of the existing foundation of scientific and technical knowledge. In the real world, of course, a goal of maximising output is circumscribed by wider public policy considerations (such as protection of natural resources and wildlife habitats, the countryside, public health and animal welfare), as well as precautionary approaches where there is public concern in some quarters about more uncertain aspects of science (such as the use of GM technology). And few today question the need to have climate change – adapting to and mitigating its impact – front of mind.

Among the sector organisations that have contributed to this chapter, there is a strong consensus that "modern" agriculture, horticulture and sea fishing can, in principle, deliver increasing output in order to feed Britain, and that this is compatible with the goals of environmental sustainability. But this will require a collective effort and collaboration among industry and policy makers, and increased understanding on the part of the public of the issues involved and of the decisions that need to be made.

Section i: Cereals
Jonathan Cowens, Chief Executive of HGCA

Cereal production in the UK is worth over £2.5 billion and is more than sufficient for the country's processing needs. Exports total between 2 million and 4 million tonnes, depending on the season. The UK imports some 1 million tonnes of bread-quality wheat, which is not grown in the UK, along with imports of maize for animal feed rations. Around 30,000 farms specialise in cereal production, with ancillary sectors accounting for thousands of jobs in trading, distribution, processing and retail. The retail sales value is three to five times that of the farm gate value of cereals. The pattern of UK supplies is set out in table 1. Over time, as production has risen, imports have fallen and exports have increased.

Table 1: UK supplies of cereal

('000 tonnes)	Average 2003-08	2006/07	2007/08	2008/09
Production	20,891	20,823	19,130	24,575
Imports	2,619	2,420	3,128	1,958
Exports	2,932	2,746	1,990	5,293

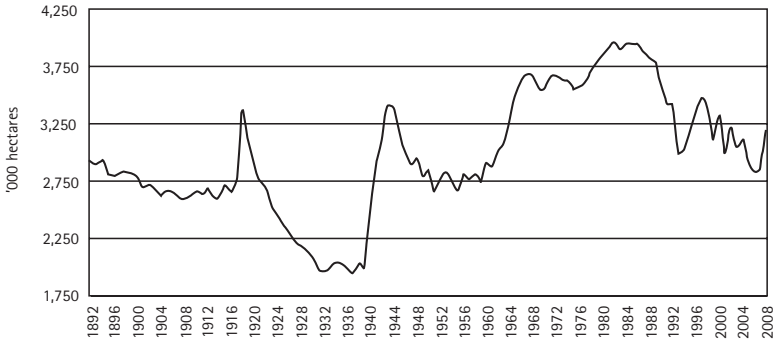
Source: Department for Environment, Food & Rural Affairs/HM Revenue & Customs

The past year has seen extreme movements in price as the market responded to low global supplies and investment interest in commodities. At the start of 2008, grain prices were at £150 per tonne and rising. They peaked at close to £200 per tonne and then fell back, with the increased global production from the new harvest and a corresponding drop in crude oil prices. UK grain prices are now just over £100 per tonne.

At the end of this section is provided a summary SWOT analysis (strengths, weaknesses, opportunities and threats) of the UK cereals sector.

Background
Cereals have long been produced in the UK, with changing patterns of plantings and production reflecting the nation's needs (see figure 1).

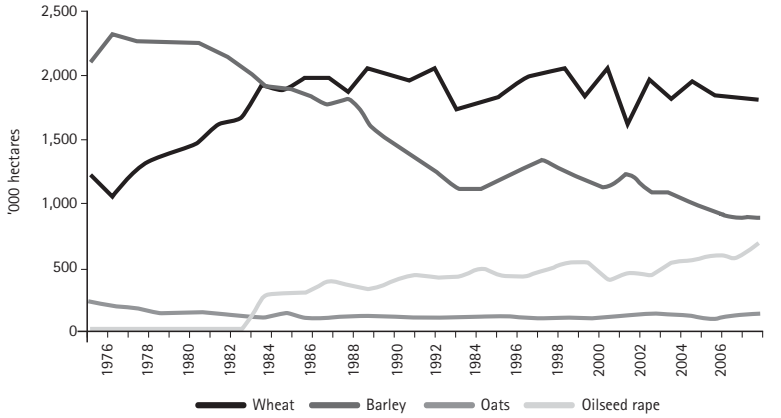
Figure 1: UK area under cereals since 1892



Source: Department for Environment, Food & Rural Affairs

Depending on market and political conditions, the planted area of cereals has varied between 2 million and 4 million hectares. At present just over 3 million hectares is under cultivation for cereals, pointing to considerable scope to expand production if needed. The area under the different cereal crops has also varied according to market conditions (see figure 2).

Figure 2: UK area under cereals since 1976

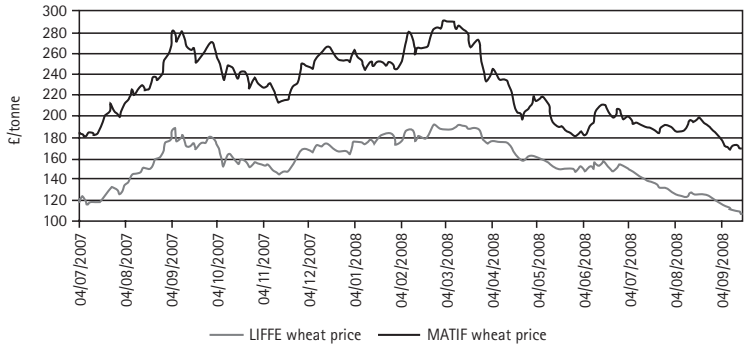


Source: Department for Environment, Food & Rural Affairs/devolved UK governments

Thirty years ago, the production of UK grains for animal feed was key, with barley dominating the cereals acreage. Since then, successes in plant breeding have resulted in higher wheat yields and a steady expansion of wheat plantings, with increasing substitution of home-grown wheat in the milling grist. The greater use of vegetable oil in food has led to an increased area of oilseed rape.

Past price trends have little relevance to today's market because of policy and market support changes. Recent price developments are shown in figure 3.

Figure 3: UK and French wheat prices since July 2007



Source: HGCA/Euronext-LIFFE

The only certainty is that grain prices will remain volatile for the foreseeable future. The volatility of grain prices in 2008 – peaking at £200 per tonne then falling back during the summer to under £100 per tonne – was reflected in the prices of animal feed, flour, bread and breakfast cereals.

Though the food industry desires stability, volatility is an inherent characteristic of both commodity and agricultural markets. Indeed, the absence of some degree of volatility can raise its own problems; for example, the build-up of massive EU and US stocks in the latter part of the last century was a direct result of removing volatility in farm gate prices. The cost of volatility must be acknowledged and absorbed.

The scope to increase cereal production in an environmentally sustainable way

One route to increasing production within environmental and land resource constraints is to provide more resources for research and knowledge exchange. Winter wheat yields have more than trebled over the past 60 years, from 2.5 tonnes to 8 tonnes per hectare. This is the result of both improved varieties and modern agronomy, including the

introduction of selective herbicides and fungicides, and more effective use of nitrogen.

Recent work suggests that in the past 25 years over 90% of yield improvement in winter wheat is due to new varieties. However, over the past decade there is little evidence of yield increases in wheat, barley or oilseed rape, in spite of the regular introduction of new varieties with higher yields. This may be due, at least in part, to shorter rotations, more variable weather patterns and sub-optimal use of pesticides and fertiliser.

With climate change scenarios indicating that Europe will have to produce more of the world's grain, static yields are not an option. Meeting the challenge will require increased public investment in strategic and applied research, which over the past decade has been significantly declining.

Improvement of relevant genetic traits is an important goal, which requires investment from the public sector and HGCA. Recent Sustainable Arable LINK programmes have been very successful in developing new tools and materials to enable improved varieties to be bred with desirable traits. Molecular biology, particularly in "model species", has been well funded in the last 20 years and has led to real advances in our understanding of gene function. However, much of this has still to be applied to crop species. Molecular biology can provide, for example, tools to accelerate selection, such as molecular markers, and a greater understanding of disease and pest resistance. The development of genetic modification to introduce novel traits – for example, to reduce pesticide inputs – has been greatly hampered in the UK and elsewhere in Europe by negative public opinion in some quarters. The need to capture public support is important to ensure that this exciting technology can be used to the benefit of all.

In the meantime, proper crop management must continue, and strategies for using approved pesticides in the most effective way, and delivering agronomic benefits with minimum environmental impact, need to be developed. Here, "precision farming", which uses satellite positioning systems to help the grower to manage inputs more exactly, is a valuable tool.

Set-aside

Another route to increasing environmentally sustainable production is through approaches to using land for environmental purposes that offset the loss of set-aside. As an EU supply management tool, set-aside is no longer seen as appropriate. But government and some NGOs have seen set-aside as a vehicle for achieving environmental benefits, albeit as a side effect of the production control role. However, these benefits are variable and difficult to measure in economic terms.

Generally fixed at 10% of arable land, set-aside equated to around 325,000-375,000 hectares. In 2007/08, some 180,000-200,000 hectares was left fallow as set-aside. Even allowing for poor fertility, this land could perhaps produce over 1 million tonnes of cereals.

A key issue from a cereals industry perspective is the balance between environmental value, and the industry's loss of production and value, as well as the loss of feed for livestock producers. In practical terms, HGCA would like to see a focus on targeted activity that is designed to meet specific environmental and production objectives. Any consideration of programmes that seek to emulate the environmental aspects of set-aside must include the economic dimension. When set-aside was an obligatory part of farm support, the EU budget met the economic cost; in a world without obligatory set-aside, this becomes a national cost.

A first step is to calculate the economic trade-off between any requirement for the farmer to take land out of production, and his market opportunities under a "freedom to farm" approach. If the environmental compliance costs to the farmer are too high, he might opt to forgo any direct support (such as through the single farm payment) in order to avoid the complicated cross-compliance requirements. This risk would apply particularly if cereals and oilseed prices are at high levels.

In summary, any market demands for more food production will create a tension between possible environmental gains from set-aside types of scheme, and the economic benefits to producers and food consumers.

Other possible areas for action include:

- better use of home-grown grain for animal feed by further improving feed conversion rates, which would reduce grain exports, and could reduce meat imports; and
- the development of biofuels building up a "free" food reserve.

The dramatic developments on world commodity markets during 2008 reminds us all that we depend upon farming to feed ourselves. Arguably, the "food versus fuel" debate has focused too much on the static nature of the problem and too little on the dynamic nature of agriculture. The recent declines in prices also remind us that a supply response, when met by unchanging demand, leads to falling prices.

Ideally, the UK (and the EU) needs a buffer stock to feed people when harvests are poor. The drawback here is the potentially huge cost, as well as the reality that the existence of stocks tends to depress markets, further increasing the cost and likelihood of short

production. One idea that has not been adequately explored is the development of bio-fuels from field crops (especially wheat and oilseed rape) to create such a reserve. Since these crops are both food crops, they could be released to the food market from the fuel sector by applying a temporary moratorium on fuel/biofuel obligations in times of short crops (anywhere in the world). This would guarantee a buffer stock at zero cost and give government direct control over substantial food supplies when this was needed.

Maximising production

The concept of peak oil has never applied to agriculture. Unlike mining or fossil fuel extraction, arable farming is a dynamic that responds to incentives and technology despite finite land use. Agricultural production is likely to continue to develop and improve, provided that resources and intellect are applied to the problem.

An examination of the recent price movements reveals that there is now a new and complicated relationship between energy prices, commodity prices and grain prices. The current low oil price is causing a reversion to lower grain prices compared with 2008, and this is reducing farmer commitment to forward production.

While the evidence of the past decade is that we may have already hit the peak in production per hectare, scientific modelling of crop physiology suggests that this is far from the case. The experience of 2008 suggests that yield trends may revert to an upward growth path if price incentives are improved again.

Conclusion

Looking ahead over the next 20-30 years, key factors that will shape the development of UK cereal production include the following:

- **Research and development (public and private):** We expect to see closer linkage in the demand chain guiding production R&D towards more market-valued activities. The decline in public funding for production R&D must be reversed.

- **Biotechnology:** This is an important part of modern science, and the industry needs to highlight consumer benefits from this powerful technology.

- **Knowledge transfer:** There is a need for modern communications to meet farmers' needs.

- **Skills and training:** In England training programmes will need to correspond to the strategic requirements of each of the regional development agencies. This process has already started in Scotland, Northern Ireland and Wales.

- **Business risk management:** HGCA is committed to promoting the use of forward market derivatives and budgeted marketing. Better planning will improve profitability and provide higher levels of business, rather than market, stability.

- **Supply chains:** HGCA already has a programme designed to encourage improvements in cereal supply chains. This will improve efficiency and reduce waste.

UK cereal production is a modern, high-technology industry and, with support, can successfully meet any production challenges placed before it.

SWOT analysis of the UK cereals sector

Strengths	Weaknesses
• High yields with low variability • Large field sizes permitting efficient use of machinery • Quality assurance/food safety systems that are well developed and integrated into the food chain • Communications systems that permit farmers to receive up-to-date information • Climate suits cereal crops – long days, moist and cool • Biofuels produce protein	• Temperate climate only – no corn or soya protein • High disease pressure • Cannot ensure imported food is vetted for quality assurance • Lack of understanding of markets • Supply chain deficiencies
Opportunities	**Threats**
• To improve supply chains • Biofuels and protein supplies – this will reduce dependency on protein imports and develop new industries • Branded chain relationships • New technology, eg through plant breeding, precision farming • Training programmes to assist farmers to modernise their business	• Poor training programmes • Loss of pesticides due to legislation or resistance • Environmental use of land • Overseas competition • Lack of strategic and applied research funding • Lack of applied researchers (eg weed scientists)

Section ii: Horticulture

Martin Beckenham, Chief Executive of the Horticultural Development Company

At present, production horticulture (including ornaments and food) accounts for 3% of the UK's agricultural area, and employs 95,166 people. Horticultural production is by nature specialised, and divided into sectors according to the crops grown and the technologies needed to produce them. This discussion includes all the sectors listed in tables 1 and 2 below.

Table 1: Production area for fruit and vegetables in the UK

Sector	Area (hectares)
Vegetables grown in the open	121,700
Orchard fruit (commercial orchards)	20,800
Soft fruit (includes crops grown in Spanish tunnels)	9,600
Glasshouse crops (vegetables, salads and fruit)	800
Total	152,900

Source: Department for Environment, Food & Rural Affairs, 2008

Table 2: Volume of fruit and vegetable production in the UK

Sector	('000 tonnes)
Vegetables grown in the open	2,039
Orchard fruit (apples, pears, cherries, plums)	284
Soft fruit	108
Glasshouse crops (tomatoes, cucumbers, celery)	177
Mushrooms	68
Total	2,676

Source: Department for Environment, Food & Rural Affairs, 2006

The number of commercial growers of fruit and vegetables in 2006 was around 1,250 (excluding Northern Ireland).[1]

1 This total represents those businesses with an annual turnover of over £60,000 from those sectors paying a statutory levy for near-market R&D.

The Horticultural Development Company's latest survey of payers of the near-market R&D levy indicates consolidation in holding size and specialisation in core horticultural activities to the exclusion of other farming enterprises in the past 10 years.[2]

The UK fruit and vegetable market

UK self-sufficiency

In past years the UK produced significantly more indigenous fresh produce (crops that can be grown in our climate and growing season), in particular vegetables, than it does today. According to the Re:fresh Directory:

Between 1988 and 1993, approximately 55% of the fruit and vegetables consumed in the UK were domestically produced. Subsequently production went into decline and fell to 33% in 2006.[3]

As self-sufficiency has fallen over the past 10 years (see table 3) imports have increased, though some of the increase in consumption is attributable to increased demand for non-indigenous produce as consumers seek greater variety. Also, consumers' expectations of year-round availability of fresh produce such as strawberries, asparagus and salads has led to imports of produce outside of the UK production season.

Table 3: UK domestic fruit and vegetable supplies 1996-2006

Sector	Total UK consumption ('000 tonnes)		Imports ('000 tonnes)		UK domestic production and percentage of total UK consumption ('000 tonnes)			
	1996	2006	1996	2006	1996		2006	
Vegetables	4,538	4,198	1,183	1,914	3,355	74%	2,284	54%
Fruit	2,853	3,856	2,487	3,464	366	13%	392	10%
Total	7,391	8,054	3,670	5,378	3,721		2,676	

Source: Department for Environment, Food & Rural Affairs, 2006

While the UK planted area has fallen, production has in many cases stayed the same or gone up due to improved yields and husbandry techniques.

2 Source: Centre for Agriculture Strategy at University of Reading, 2008
3 Fresh Produce Consortium "FPC 2008 Summary" in *Re:fresh Directory 2008* (Fresh Produce Journal, 2008)

Table 4: Change in UK area planted and production of selected indigenous vegetables and fruit 1997–2006

Product	Change in area planted (%)	Change in volume of production (%)
Carrots	-8	+13
Parsnips	-18	-13
Turnips and swedes	-14	-9
Onions	-7	+6
Brussels sprouts	-41	-42
Cabbage	-26	-17
Cauliflower and broccoli	-23	-36
French and runner beans	-46	-49
Peas for market	-40	-28
Peas for processing	-15	-26
Asparagus	+73	+66
Leeks	-28	+3
Field lettuce	-1	-20
Rhubarb	-36	-17
Tomatoes	-34	-26%
Cucumbers	-39	-31
Apples	-33	+29
Pears	-40	-14
Plums	-31	+17
Strawberries	+6	+125

Source: Based on Department for Environment, Food & Rural Affairs *Basic Horticultural Statistics 2008* and taken from *Rethinking Britain's Food Security* (City University, 2008)

Value

Total expenditure on fruit and vegetables in 2007 was £7.9 billion, split roughly evenly (53.4% on vegetables, 46.6% on fruit), representing 27% of the total fresh and chilled foods sector spend.[4] Fresh produce is a staple grocery item, accounting for 14.8% of weekly expenditure on food and drink in 2005. The UK market for fresh produce grew 21.7% from 2001 to 2005, one of the highest-growth sectors in food and drink retail.[5]

4 Source: TNS Worldpanel

5 Source: *Fruit & Vegetables Market Report 2006* (www.researchandmarkets.com)

The market for organic fruit and vegetables is growing, but is still very small and most of the produce is imported. Mintel estimates that the value of this sector has grown by 61% over the past five years, reaching an estimated £502 million in 2007. Despite this growth, and Mintel's prediction that market value will increase by a further 42% to 2012 (at current prices), sales of organic produce accounted for only 5.3% of total fruit and vegetable sales in 2006.[6]

Consumption

Consultancy Promar reports:

Consumption of fresh produce in the UK has remained relatively static over the past 10 years. Growth has often come from imported exotics and snack products rather than traditional fruit and vegetable products.[7]

Over the past decade the total quantity of fruit and vegetables marketed in the UK grew by about 1 million tonnes. The Fresh Produce Consortium estimates that the market still has potential for further expansion in order to meet consumption targets: "If the entire UK population were to eat the recommended five a day, actual consumption would be in the region of 8.8 million tonnes, as opposed to less than 8.2 million tonnes, as was the case in 2006."

There is some positive evidence of changes in consumption. Press coverage of the positive health benefits of fruit and vegetables in recent years has in some cases increased consumer uptake, particularly for the so-called superfoods. For instance, sales of blueberries have increased 132% year-on-year, while blackberries, spinach, tomatoes and watercress have also benefited.[8]

5 A DAY and related promotional campaigns

"Reaching the 5 A DAY target for fruit and vegetable consumption could mean that around 42,000 premature deaths are avoided each year," claims the Cabinet Office.[9] Despite more than 10 years of health campaigns regarding the benefits of increasing consumption of fruit and vegetables, the target of five portions per day has still not been reached. The latest government statistics show a small increase to 3.9 portions per day for all households, but only 3.5 for low-income households.

6 Source: Fearne, A *Organic Fruit & Vegetables – Who Buys What & Why... & Do We Have a Clue?* (dunnhumby Academy of Consumer Research at Kent Business School, University of Kent 2008)
7 Promar International *The Future of UK Horticulture* (2006)
8 Campden & Chorleywood Food Research Association *CCFRA Review No 61* (2008)
9 Cabinet Office *Food Matters* (2008)

However, as the figures are based on what people purchase rather than what they actually eat, the actual consumption figures may be lower. The 2004 DEFRA family food survey[10] estimated that more than 10% of household food purchased was lost as waste, while the 2004 ONS National Diet and Nutrition Survey suggested that the figure for consumption of fruit and vegetable portions may still be as low as 2.8 per day.

Forecast consumer trends

According to Promar, over the next decade the horticultural market will experience a further decline in sales of mass-market goods in favour of greater consumer polarisation between economy-positioned and value-added products, in line with changing distribution of consumer income.[11, 12]

Mintel predicts that the overall value of vegetables is likely to grow faster than fruit because vegetables have more scope for "adding value" than fruit, which are, in their natural form, already convenient. Much of the growth will come from the ready-prepared sector.

The multiple retailers will continue to dominate – they accounted for 86.4% of fresh produce value spend in 2007. However, there will be growth for niche markets such as organics and farmers' markets. There will also be growth in the food service and catering sectors and electronic and internet-based shopping systems.

A summary SWOT analysis (strengths, weaknesses, opportunities and threats) of the UK horticulture industry is given at the end of this section.

Ways to increase production

Climate and the growing season impose limits on how far UK growers are able to meet demand for fruit and vegetables. However, 20 years ago domestically grown crops accounted for 55% of the market for fruit and vegetables. Changes in demand for particular fruits and vegetables and import substitution account for much of the decline in self-sufficiency, but for many crops production levels have been maintained or increased, whilst the area of land used to produce them has declined significantly. This has been achieved as a result of new technology, better yields and cost reductions. This suggests that production of indigenous fruit and vegetables could be significantly increased in the next 20-30 years.

10 Department for Environment, Food & Rural Affairs *Family Food – A Report on the 2003/04 Expenditure & Food Survey* (2004)
11 Promar International, op cit
12 This assumes a shrinking of middle-income consumers (from 70% to 20%) over the next 10-15 years, with a corresponding increase in poor (18% to 45%) and wealthy consumers (12% to 35%).

Expansion and increased production can happen only if a vibrant, profitable and financially sound industry – run by a dynamic, skilled, well-trained workforce from a balanced demographic and supported by viable research and development institutions, technical advice and sound supply industry – is in place. However, at present much of the industry is not profitable, leading to a lack of investment and low interest in succession in many family businesses. Horticulture R&D facilities have been dramatically reduced and fragmented over the past 20 years, and the age profile of researchers and particularly crop agronomists is a cause for concern.

Key issues

1. Research and development (public and private)

A key conclusion of the 2006 Promar report on the future of UK horticulture was "the continuing need for innovation in all aspects of the industry, and that this requires continuing investment in research at the fundamental, strategic and applied levels".[13] This view was supported by researcher Brian Jamieson:

The production horticulture industry has a continuing need for a programme of applied R&D, mainly crop-specific, supported by industrial levy and managed by the HDC, and strategic R&D, beyond the scope of levy funding, that addresses the broader challenges of environmental impact and resource efficiency; increased technology capability and infrastructure; and sustained human health and well-being. Legislative changes (eg impending EU changes to pesticides legislation) will present further challenges that will require underpinning R&D.[14]

In recent research carried out by the Centre for Food Policy in City University, and based upon interviews with UK food chain stakeholders, "the reduction of public funding of agricultural research by successive governments was widely seen to have set British farming back and penalised UK farmers in relation to EU competitors".[15]

2. Labour and skills

The horticultural industry is labour-intensive and relies on migrant labour for routine and seasonal activities. The 2006 Promar report highlights that the "decline in employment of indigenous UK labour is a stark fact of life. Attracting UK labour back into the horticultural sector has proved to be very difficult, despite the best efforts of many." For future development of the industry the use of imported and migrant labour must be sustained.

13 Promar International, op cit

14 Jamieson, B *A Review of the Provision of UK Horticultural R&D for the National Horticultural Forum* (Brian Jamieson Associates, 2008)

15 Barling, D, Sharpe, R and Lang, T *Rethinking Britain's Food Security* (Centre for Food Policy at City University, 2008)

The age profile of the present labour force is a matter of concern. Forty percent of workers are within 20 years of retirement whereas only 5% are under 26, and LANTRA – the sector skills council for environmental and land-based industries – reports that annual retirements from production horticulture are running at 3,500 whereas only 900 18-year-olds are joining.

Horticulture has a negative employment image, which the Promar report identifies as being linked to hard work, low pay and limited career prospects. This image needs to be reversed. University horticultural courses have declined, and vocational training at further-education level for practical edible horticulture is limited. Training initiatives, particularly supported by regional development agencies, could be helpful.

3. Biotechnology

Biotechnology has much to offer, and many UK horticultural research projects are applying biotechnology to offer future solutions to present problems.

Biopesticides – crop protection products based on natural substances or living organisms such as microbes – will become increasingly important for sustainable crop protection. In the UK six microbial biopesticides have been approved, whereas in the US some 80 microbials are available.

Since the health benefits of fruit and vegetables come from phytochemicals, manipulation of plants to produce higher levels of phytochemicals is of considerable interest. Biotechnology now permits metabolic pathways to be genetically engineered to increase the levels of phytochemicals, but consumer resistance in UK and Europe to such techniques means that delivering these improvements will take longer, as conventional breeding will be much slower.[16]

The impact of EU 91/414 legislation over the next 15 years is likely to reduce the availability of agrochemicals, and so will threaten the ability of UK producers to protect their crops and thus to produce economically. Many crops, such as carrots, could no longer be produced within the EU because of the loss of essential crop protection products. The overall impact will 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. In the long term this situation could be mitigated by the uptake of biotechnology, but we do not have the solutions at present.

16 Campden & Chorleywood Food Research Association *CCFRA Review No 61* (2008)

4. Knowledge transfer

There is considerable concern in this area. A National Horticulture Forum skills audit highlighted the loss of key knowledge transfer expertise.[17] The Promar report states:

Historically, horticulture has been quick to take up new technologies, but the loss of key personnel through retirement, and the lack of successors, indicates that a vacuum is developing in the vital area of translation of new technology from the laboratory to the field.[18]

Conclusion

There are distinct opportunities for the industry to increase production of fruit and vegetables over the next 20-30 years. The industry could supply UK consumers with a high proportion of the vegetable crops that can be grown in our climate, and also indigenous fruits during our season extended by protected cropping techniques for soft fruit and cold storage for top fruit.

The scale of production increases and the time frame would be limited by the availability of both unskilled and skilled labour, investment confidence, the lack of central government funding for R&D – which is vital for generating the innovations needed to sustain the industry into the future – and the lack of government strategic policy for horticulture and agriculture.

17 National Horticultural Forum *A Skills Audit of Horticultural Research & Development* (2004)
18 Promar International, op cit

SWOT analysis of the UK fruit and vegetable sector

Strengths

- Technically advanced production
- Well-developed assurance schemes
- Backed by decades of high-quality R&D
- Better awareness of health benefits of fruit and vegetables
- World-renowned research institutions
- Sophisticated food supply chain
- Healthy foodstuffs (some claimed as superfoods)
- Fashion trends for healthy eating and local produce
- UK supermarkets world leaders in distribution efficiency
- Effective arrangements for applied R&D through Horticultural Development Company
- Strong knowledge transfer of latest R&D via Horticultural Development Company and crop consultants

Weaknesses

- Decreasing government funding for R&D over past 30 years
- Shortage of skilled labour
- Low return on investment
- Slow and expensive legislative system for bio-pesticide approvals
- Poor level (250g/day) of fruit and vegetable consumption by UK population in comparison with recommended 400g/day
- No nutrient recirculation from domestic waste water system
- Low proportion of workforce and management with high-level training
- Lack of accurate cropping/market data
- Contracting supply and ancillary industry
- Reliance on non-sustainable resources eg peat, plastics
- Fractured and weak wholesale markets
- Ageing growers and workforce
- Loss of local greengrocers
- Independent crop consultants retiring without successors
- Lack of strategic policy direction

Opportunities

- Climate change: wider range of crops, longer growing season
- Varietal development conferring positive production and resistance attributes
- Tunnel production to extend season
- Nutrient recycling from waste water
- Mechanisation/robotics
- Product development and added value
- Proven intervention programme (Food Dudes) to increase fruit and vegetable consumption – large saving of NHS costs
- Trend towards local sourcing, including farmers' markets and box schemes
- Greater production specialisation
- Waste reduction on farm and post-harvest
- Biotechnology – accelerated delivery of desirable characteristics in new varieties

Threats

- Closure of research facilities due to reduced government funding for primary horticulture
- Pesticide availability (legislation)
- Availability and rising costs of nutrients
- Shortage of seasonal labour (hand harvesting for many crops)
- Closure of specialist university courses
- Water availability – competition from domestic population
- Climate change – new pests and diseases and lack of winter "kill off"
- Flooding – potential loss of low-lying land with rising sea levels
- Pollination concerns due to bee population decline
- Planning issues, eg polytunnels
- Skill shortages: insufficient experienced personnel for effective applied research and knowledge transfer
- Failure to address poor public and political perception of production horticulture
- Public lack of acceptance of biotechnology

Section iii: Potatoes

Helen Priestley, Chief Executive of the Potato Council

Potatoes have featured prominently in historical food security struggles (such as the Dig for Victory programme during the Second World War, and the Irish famine a century earlier). However, they are perhaps less relevant to the present UK food security debate, since total GB production is already sufficient to satisfy demand: 70% of GB needs are met by domestic production, while imports, which provide the remaining 30%, could largely be substituted with existing GB production that is exported or wasted.

Imports increased rapidly between 1995 and 2000 because of the EU trade barrier removal but declined after 2002, while exports are slowly increasing. Current imports of potatoes or potato products come almost exclusively from European neighbours, as opposed to being sourced on more volatile world markets. They also generally fill very specific niches. Fresh potato imports are rare, and premium imports are mostly for out-of-season purposes, for example very early new potatoes. Imports of pre-processed products are almost entirely at the economy end of the market, most notably pre-prepared chips for the food service industry. In the present market environment it is unlikely that the market would compete for these low-return markets or out-of-season niche opportunities, owing to industry structure, restricted availability of suitable land, and grower and supply chain financial expectations.

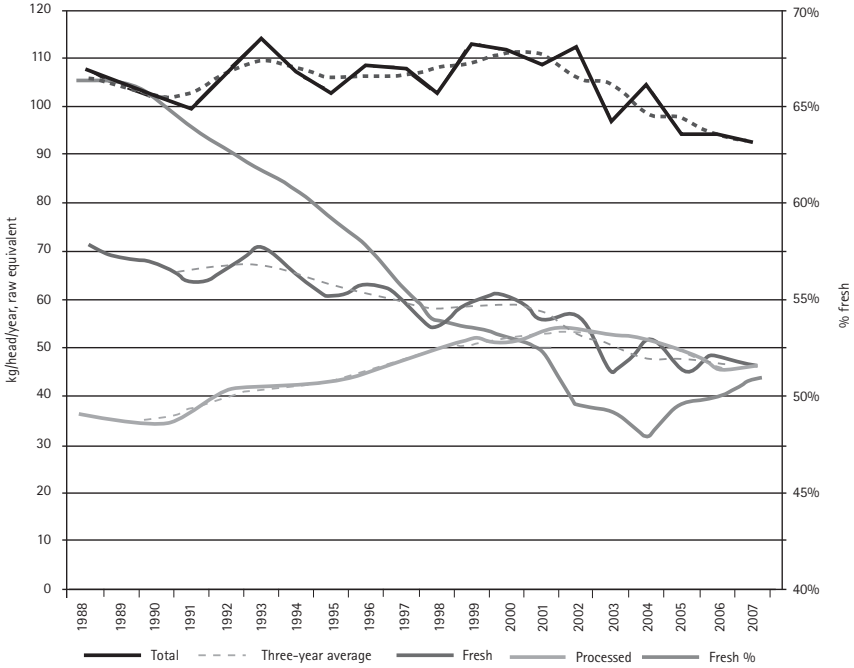
Since the removal of production quotas in the 1990s, the focus of the industry and its levy body, the Potato Council, has been on improving financial rewards as opposed to increasing production, as well as ensuring that GB potatoes are best placed to meet consumer needs and that potatoes maintain their position against rival carbohydrates like rice and pasta.

Industry background

The GB potato market is valued at £742 million at farm gate and in excess of £3 billion at consumer level. Approximately half of the crop is sold fresh and half processed. A similar split applies to whether the potatoes are eaten in- or out-of-home. GB potato consumption has been relatively stable for the last 20 years (see figure 1). Production has also been fairly stable; it fluctuates with the weather but has been on average around 6 million tonnes a year since 1960. However, GB requirements seem to have fallen to around 5.8 million tonnes a year.

Figure 1: Per capita consumption 1998–2007

Consumption overall has declined slightly since 2001, perhaps because of greater efficiency in food service. Fresh consumption has declined and processed increased, but this trend has reversed since 2004.

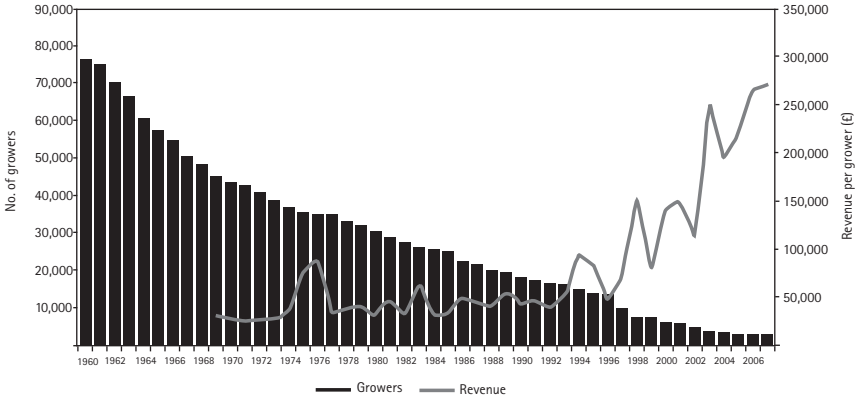


Source: Potato Council

While total production has been steady, the number of potato growers has declined rapidly, falling by 70% in 10 years (see figure 2). Crop area has also been in decline (see figure 3), but this has been compensated for by a steady rise in yield per hectare, which has doubled since 1960.

Figure 2: Grower numbers 1960–2007

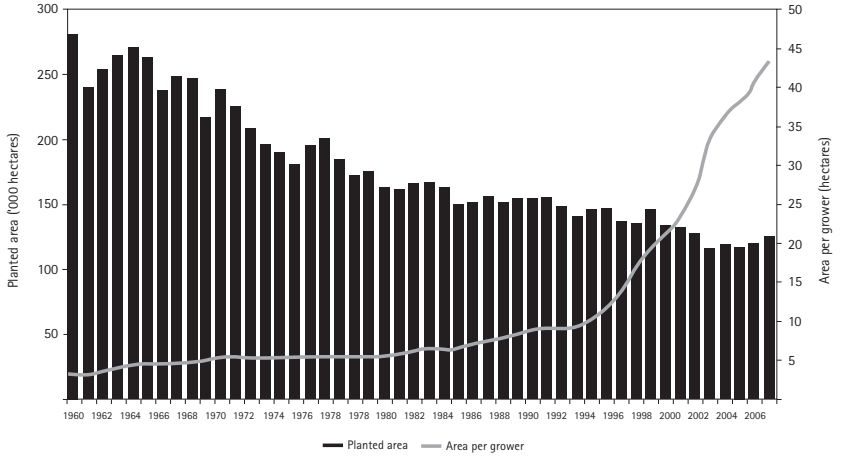
Grower numbers have declined drastically since 1960. Gross revenue per grower remained stable until deregulation in 1996, then increased dramatically.



Source: Potato Council

Figure 3: Area planted 1960–2007

Planted area has fallen by more than half since 1960, while average area by grower has shot up since 1996.



Source: Potato Council

Geographical spread is relatively stable and heavily concentrated around Eastern England (55% in 2008). Twenty-two per cent of the crop is grown in Scotland, and although this overall figure is relatively stable, the proportion grown for seed is declining in favour of ware potatoes. This is a strategically important issue as lower GB seed production inevitably results in higher levels of seed imports. Not only is this relevant to the issue of self-sufficiency, it exposes the whole industry to a much higher risk of very serious disease outbreaks, such as brown rot and ring rot.

Overall, there is a clear correlation between price and area planted, with higher prices attracting greater plantings, and vice versa. Similarly, there is a link between availability and price: a 5% increase in production leads to a 20% drop in price. The threshold is the level of GB average consumption, at about 5.8 million tonnes of production, with total yields below this resulting in higher prices, and above it causing a sharp fall.

Low prices and resulting grower losses typically lead to reduced plantings the following season. Therefore, any sustained drive to increase UK production would probably have to go hand-in-hand with a sustained increase in demand, or with some official price control mechanism. In the absence of a food supply crisis neither of these appears likely, particularly as three out of every seven meals already include potatoes. Potato production is a high-risk, capital-intensive option, and statutory intervention in agriculture is not current government policy.

Potato growers and researchers are characterised by an increasingly older age profile. This, coupled with low levels of new entrants (growers, agronomists, scientists and marketers), is a matter for particular concern given that any drive to maintain or increase production and efficiency will require skills, energy and fresh thinking.

A SWOT analysis (strengths, weaknesses, opportunities and threats) for the potato industry, adapted from the Potato Council's corporate plan, is contained at the end of this section.

For the purposes of this discussion, it is assumed that any increase in production is sustained by greater demand, although the comments above give cause to doubt this. If greater availability of potatoes were required, then the focus for achieving this would fall in two areas – increasing yields and reducing wastage of what is already produced.

Increasing yields

Higher yields depend predominantly on climatic factors, varietal potential, and effective pest and disease control.

Climate

Climate is a major factor, with unusually dry weather affecting yields, while unduly wet weather affects growers' ability to lift the crop and can also affect yields.

Opinion is divided on how climate change is likely to affect GB potato production, but overall the impact is likely to be negative. Future availability of water at an affordable cost is of immense strategic importance to potatoes. Efficiency of water use is among the factors that might be addressed through GM technology (discussed further below), and is an area of current research effort.

Varietal potential

Varieties also have a marked effect on yield. Traditional breeding technology continues to deliver production advances. However, these do not always go hand-in-hand with consumer preference. In contrast to some other crops, retail consumers prefer to buy specific varieties, and a number of new, very high-yielding varieties have not found widespread acceptance. As a result, choice of potato varieties remains relatively static year on year. While no fewer than 192 varieties were planted in 2008, just 20 accounted for three-quarters of all plantings, and seven accounted for 50%. New variety development for yield traits is not, therefore, the sole solution to achieving higher production.

Current Potato Council initiatives focus on assisting the industry to make better use of existing preferred varieties. In many cases this includes making better use of existing knowledge. New approaches to knowledge transfer are required.[1]

Pest and disease control

Pests and diseases constrain the potential to increase production and pose a threat to maintaining levels of production, with potato cyst nematode probably the greatest strategic threat to GB potato production. If the GB industry has reduced access to plant protection materials, and no access to GM technology, many argue that the land bank capable of growing potatoes will decline sharply, with a correspondingly steep rise in imports.

Additionally, even with current access to plant protection materials, pests and diseases in field and store still cause losses estimated at 11% of the GB potato crop.

EU steps to dramatically reduce access to crop protection materials are a significant threat to sustainable production. In these circumstances, it is likely that average GB potato yield per hectare would fall very significantly, and this would be compounded by a reduction in the

1 For example, a current Potato Council grower collaboration project is showing how marked progress can be achieved by increasing marketable yield through communicating how planting density affects compliance with market specification.

land area on which potatoes can be successfully cultivated. Taken together, these factors would almost certainly lead to a major reduction in the proportion of demand met by GB production from its current level of 70%. Rather than meeting a perceived need for increased production, the industry would be focused on stemming the loss of yield to the best of its ability.

As production falls, prices rise, with the likelihood of increased imports from countries where land is more plentiful for low-input production. Therefore, widespread withdrawal of plant protection materials is entirely incompatible with any desire to increase overall GB potato production or to achieve self-sufficiency for potatoes.

GM technology

GM technology could well play a role in addressing climate change, varietal yield potential, pest and disease control, and the amount of water and energy required to produce the crop. Not only could it deliver advances in these areas, it also has the potential to combine such advances with favourable keeping, cooking or eating attributes, thereby helping to improve adoption of new varieties by industry and consumers.

However – despite these significant potential benefits – in the absence of a food supply crisis, a great deal of effort would be required to secure consumer acceptability of GM technology. Consumer opinion tracking over a number of years has shown significant (albeit often ill-informed) concern over GM issues, and also indicated that periodic GM-related potato scares quickly dented consumer confidence in potatoes. As highlighted earlier, work would also be required on consumer behaviour, given the very strong allegiance to specific existing varieties.

Reducing wastage

Wastage is also linked in part to effective pest and disease control in field and store. As such, the same concerns apply regarding continued access to effective control measures. Aside from this, wastage falls into three main categories – field leavings (that is, unharvested crop), post-field industry losses, and losses in the home.

Field leavings

Estimates suggest that about 12% of crop by weight may be left in field during a typical harvest. However, reduction of field losses would require significant investment in either manpower or engineering technology and is not considered a priority.

Post-field losses

Losses during storage, processing, packing and retailing can be for a number of technical reasons. Knowledge already exists to counter many of these problems in order to reduce

average storage losses from their present level of about 4.5%. Significant effort is already being devoted to knowledge transfer in this area. Considerable knowledge transfer effort is also directed to reducing bruising, which affects 10% of the crop, and about half of this volume is wasted as a result.

In addition to rejections for technical reasons, a large volume of crop fails to reach market because of rejections on aesthetic grounds; though in years of tighter supplies, aesthetic quality thresholds have been markedly reduced. Tackling the issue of wastage for aesthetic reasons would require a greater understanding of consumer and retailer thinking and a major re-education process, almost certainly with government and third-party support.

In-home wastage

A major education initiative would also be required to tackle in-home losses, but the rewards could be sizeable. For example, the Waste & Resources Action Programme recently estimated that consumers throw away 5.1 million potatoes every day, roughly equivalent to 3% of total GB production. WRAP also estimates that the equivalent of 300,000 bags of crisps are wasted every day.

Summary

The challenge of significantly increasing overall output of potatoes is not a relevant one in the current British marketplace. Indeed, a more likely challenge will be to maintain production as the constraints on potato production increase, whilst encouraging younger consumers to eat potatoes to maintain consumption. Nevertheless, a significant increase in potato production (and in GB self-sufficiency) is theoretically achievable. Moreover, it may not require significant additional land.

The principal requirements would be:

- sufficient demand to create a market with sufficient sustained financial incentive to motivate increased production;
- increased investment in research and development;
- a further focus on innovative knowledge transfer techniques to achieve both increased yields and lower wastage;
- access both to new technology (such as GM) and to existing pest and disease control methods (and consumer acceptance of these);
- further efficiencies in packing and processing plants to reduce wastage; and
- a collective will to address consumers' behaviour (varietal preferences, rejections on aesthetic grounds, and in-home wastage).

The majority of these action points would require clear leadership from government. It is perhaps questionable whether such prioritisation can be justified in the absence of a food supply crisis.

SWOT analysis of the GB potato sector

Strengths

Industry structure

- Highly integrated/rationalised industry – area per grower up 72% in 10 years
- Production has been stable (but five-year averages show downward trend)
- Specialised growers work with specialist buyers: 74.1% of crop is grown on pre-season contract or to a committed buyer
- Industry has invested heavily
- Communication generally good, with significant co-operation on overarching issues, eg residues, quarantine diseases (but some gaps)
- UK sector is world leader in environmental sustainability

Growers and supply chain

- Innovative and professional growers are among the best in the world
- High GB specs leading to quality production and significant expertise versus EU/world competitors. Also high adherence to protocols versus competitors
- Quick industry response to consumer concerns

Market

- High-value domestic market: 2006 ex-farm value £742 million, 2005 consumers' value £3,041 million (without consideration of multiplier effects, other economic benefits). Key exporter of high-quality seed
- GB retail environment probably the most sophisticated in the world
- High investment in storage for 3.5 million tonnes (53% fresh and 47% processing)

Export

- Seed industry free from key organisms (ring rot, *Dickeya* etc). Safe Haven
- Government support in export
- Increasing proprietary varieties for export

Weaknesses

Growers and supply chain

- Grower base can be change-averse. Also huge variance between top 20% of growers and others (80/20 rule)
- Older age profile of industry (growers, supply chain, science base)
- Shortage of promotional and marketing expertise and a problem promoting potatoes as a generic. Also low levels of new product development
- Issues with information flow. Industry failing to use knowledge effectively. Lack of skilled people to deliver knowledge, or supply chains not working with industry bodies to deliver
- Significant defects affect marketable yield. Loss of around £90 million a year, of which a third could be reduced by R&D uptake leading to better practice
- Packing/processing rejects not being used industrially (flake, granules)
- Storage profile in need of reinvestment, eg bulk for processing

Export

- Lack of promotional resources compared with overseas competitors
- Increasing financial risk in seed production
- Historically, taking long-term view difficult given short-term financial risks

Environment

- Limited land bank and lack of clean land (potato cyst nematodes, rhizoctonia etc)
- High user of energy, water and fertiliser. Also high user of pesticides, and concerns about residues. Reliance on CIPC is major risk
- Lack of knowledge of relative performance as to carbon and water use footprints

Product
- Excellent product with high consumer penetration. Versatile, great health profile, value for money. Perceived as very "British" – matching current consumer trends

Industry bodies
- British Potato Council success in encouraging co-operation on overarching issues and communicating opportunities to improve competitiveness (85% satisfaction in fresh start survey – very high compared with other bodies)
- Other organisations, such as Potato Processors Association and British Potato Trade Association

Other
- Sector supported by a strong science base, both strategic and applied, and independent regulatory bodies
- Favourable climate, and potatoes are an excellent break crop in the rotation
- GB's island status has safeguarded both the market and health status
- Good career opportunities (but limited young entrants)

Financial
- Retailer dominance has affected farm gate
- Significant increase in external costs, eg energy, fertiliser and transport
- Price pressure affecting some sectors' ability to make capital investment
- Increased freight costs affect exports (but also potato/product imports)

Knowledge gaps
- Lack of understanding/knowledge of some critically important diseases, eg potato cyst nematodes, rhizoctonia, changing blight populations, powdery scab
- Slow rate of varietal improvement and uptake
- Lack of penetration of knowledge transfer at middle to lower end of grower ability/scale
- Incomplete understanding of crop physiology and biochemistry
- Lack of "health-related" research in pipeline

Product
- Rise in imports (31% since 1996, particularly in processed sector)
- Per capita consumption reduced (2003: 108.6kg/person/year, 2005: 94.7kg/person/year)
- "Traditional" product, with age profile skewed to older consumers. Significant competition from carbohydrate imports, such as rice and pasta, especially among young people
- Misunderstanding of nutritional status of potato

Other
- Lack of new entrants. Growers – cost of entry. Scientists – lack of relevant courses and subsequent rewards. Other workers – negative perception of status/benefit. Foreign labour also becoming less available

Opportunities

Technology
- Genomics and GM technology could offer step change in industry
- Competitiveness (tide of opinion changing gradually)
- Exploitation of technologies such as polymerase chain reaction diagnostics
- Improved food processing/cooking in factory and at home
- Improved understanding of critical issues, eg diseases potato cyst nematodes, rhizoctonia,

Threats

Climate change
- Introduction of new pathogens affecting field and storage
- Huge variance between top 20% of growers and others
- Increased virus/blight/pest pressure, volunteer potatoes
- Adverse and unpredictable climate conditions

blight populations, powdery scab, production inputs and storage costs
- Improved communication systems
- Industry to take on board "known" knowledge. Potato Council/industry to create pathways to deliver greater level of penetration into farms, "putting science into practice"
- Store control and building design for improved efficiency, ie energy use, sprout and disease control
- Whole food approach to food education is promoted through schools and practical cookery becoming compulsory in England

Product
- Overcoming misconceptions regarding versatility, convenience and healthiness of potatoes, including benefits such as greater satiety
- Use of new pack size legislation to give consumers what they want
- Greater new product development
- Exploiting the "Britishness" of potatoes. Also differentiating British product on quality grounds rather than price
- Developing more "brands" for fresh potatoes and processing to move away from generic super-market branding
- Packaging the product in relation to the current climate
- Capitalising on high rice and pasta prices
- Increased public distrust of media information about food and nutrition – journalists need access to reliable sources of information
- Consumers seeking fewer additives – seeking foods perceived as more "natural"

Export
- Increasing demand for British seed potatoes overseas
- Collaboration/education in overseas markets to develop increased demand and tackle restrictive import conditions
- Reduced supplies
- British research at strategic level, eg genomics delivering solutions for seed industry problems

Collaboration
- Potential for significant cross-sector linkages through Agriculture & Horticulture Development Board

Legislation
- On pesticides and the environment will limit availability and high-cost alternatives could affect production
- On environment will also affect fish and chip shops, eg recycling fat
- On water and soils will affect ability to use current growing practices
- On labour could affect the availability of workers
- On acrylamide could damage the fresh and food service sectors

Product/consumer
- Changing demographics and consumer behaviour. Diminishing cooking skills among young people
- Perception of potatoes (see weaknesses): negative media stories regarding potatoes; Food Standards Agency saturated fat campaign
- Imports (particularly from former Eastern bloc)
- Consumer resistance to GM
- Current climate drives the industry to sell purely on price, driving it back to a commodity market

Research
- Declining research base in UK. Fractures in the research chain from basic science to applied research
- Less crop-specific information, owing to government policy
- Science on critical issues such as potato cyst nematodes, rhizoctonia, blight and powdery scab does not come through
- Lack of agronomists means existing knowledge is not communicated

Export
- Transport cost – distance to markets
- More export competition from developing seed industries, eg China, India
- Tightening of import conditions in some export markets because of lack of knowledge is increasing risk

Other
- New levy board does not fulfil opportunities and valuable "market failure" resource is lost
- Agriculture & Horticulture Development Board "collaboration" diverts funding from potatoes
- Logistical issues cause export problems
- More Scottish ware production affects clean land availability for seed

- Potato Council opportunity to address sustainability from environmental and economic perspective. Potato Council ability to deliver "fresh start" after extensive consultation
- International potato collaboration
- Encourage a "centre of excellence" to train industry technologists to impart R&D knowledge to all levy payers
- Potato Council to develop better methods of engaging with levy payers
- Greater engagement with stakeholders and industry partners for R&D/knowledge transfer

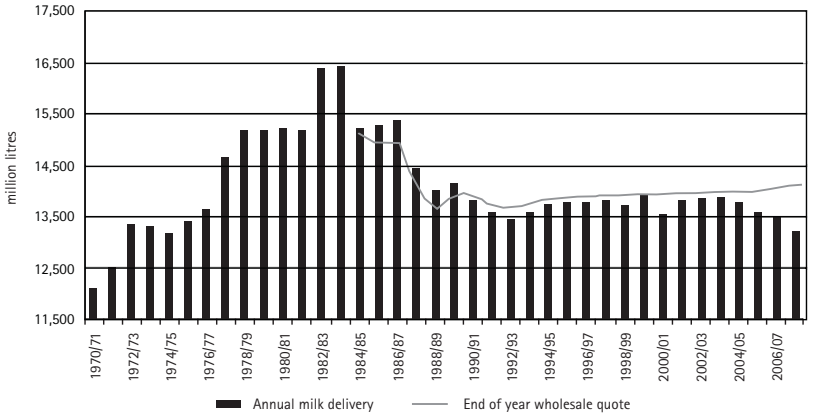
- High cereal price and commodity competition affects potato production
- Pressure on organic sector (eg blight) may see growers cut production
- Farm gate margins cause widespread concern
- Large-scale production is not always compatible with precision farming
- Reduction in funding opportunities from government sponsors, eg Sustainable Arable LINK
- Lack of succession in many farm businesses. Also skills drain into other, more attractive industries
- Ability of farmers to generate cash flow to sustain operations in light of current agricultural inflation
- Increasing gap in risk-to-reward ratio of potatoes compared with other crops

Section iv: Dairy
Ken Boyns, Chief Executive of DairyCo

Overview of the UK dairy sector[1]

UK milk supply has been declining for the past five years. In the latest milk year, ending 31 March 2008, some 13.215 billion litres of milk were delivered to UK dairies – 310 million litres (2.3%) lower than the previous year, and about 745 million litres under quota. For the current milk year, milk supply will be lower than last year.

Figure 1: Annual milk deliveries versus milk quota

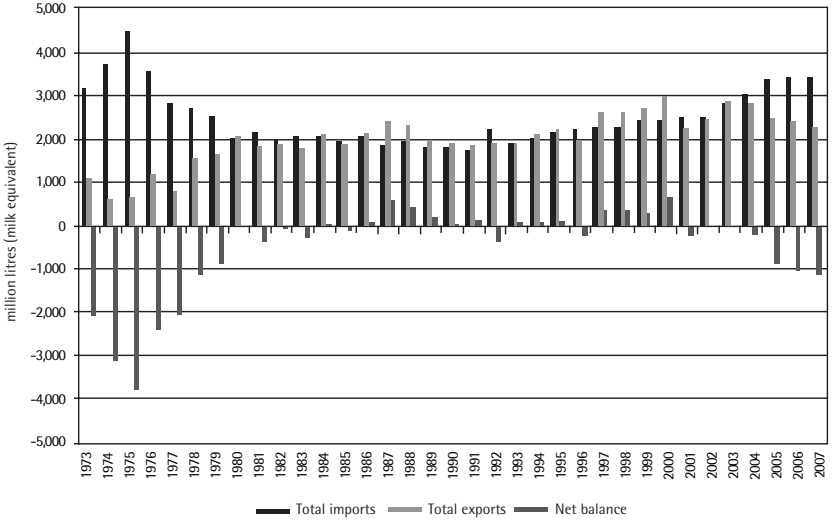


Source: Rural Payments Agency

Figure 2 shows that, for most of the period since the 1980s, the UK's imports and exports of milk and dairy products have broadly balanced. However, from 2004, the UK became a net importer in order to satisfy domestic demand. In 2007 the UK relied on the equivalent of 1.1 billion litres of imported milk, equivalent to 8.3% of domestic production. In addition, the UK typically exports low-value commodity products and imports higher-value products such as branded butters and speciality cheeses.

1 This discussion assumes that the UK land area available for dairy farming remains constant over the next 20-30 years, even though competition for land with other agricultural sectors and non-agricultural sectors – including urbanisation, recreational activities, wildlife and so on – is likely to occur. Also, it is assumed that the environmental and economic environment remains similar to the current one.

Figure 2: UK dairy trade



Note: 2007 data is provisional

Source: DairyCo calculations based on the total solids content method

Total domestic consumption of dairy products has grown at an annual rate of approximately 0.44% over the past 13 years. Although in-home consumption of dairy products has declined per capita, out-of-home consumption and the consumption of ready meals have increased. However, this small annual increase in consumption can largely be attributed to UK population growth, which has stood at similar levels over the same period.

If the observed 0.44% annual increase in consumption is extrapolated forward, annual UK consumption in 2030 could be in the region of 16 billion litres, which is 23% greater than the current UK production level. However, there are many positive and negative factors that may affect consumer consumption behaviour over this period. On the negative side, concerns over saturated fat levels and climate change may reduce demand. On the positive side, increased awareness of the health benefits of milk and new product innovation may boost consumption. Combining these factors, it is estimated that consumption in 2030 is likely to be somewhere between 14 billion and 16 billion litres.

The price dairy farmers receive for their milk has fluctuated between 15p and 28p per litre over the past 13 years, and this has meant wide variations in profitability. After a period of relatively low prices between 1998 and 2006, prices began to increase in 2007 following

the boom in global dairy commodity prices. This trend will be reversed in 2009, with price cuts already announced by some milk buyers.

As well as historically low farm gate prices, dairy farmers have also had to manage rising input costs, which has left little spare for reinvestment. The UK average farm gate price has been consistently below the average for the EU-15 throughout the past decade, which partly explains why British dairy farmers have underinvested in their businesses compared with their European counterparts.

According to a DairyCo survey in March 2008, 50% of dairy farmers intended to invest less than £25,000 in the next five years, with the majority of this being spent on general maintenance. This suggests that the level of investment in British dairy units will continue to be low.

Forecasting future prices and hence supply is fraught with difficulties, as many of the influencing parameters cannot be predicted. With the EU authorities reducing market management measures, prices will become more volatile. This will present a challenge for dairy farmers as the whole supply chain learns how to manage this volatility.

The UK dairy sector has significant potential, with the nation's heritage of fresh milk consumption, together with an ideal climate for dairying and high levels of efficiency on many farms. However, the sector faces challenges, including increased price volatility, increased global competition and climate change. Historic trends of volatile profitability, a lack of innovation in the processing sector (although this is improving) and prices that are generally lower than the EU average mean the industry lacks confidence and is facing potentially lower milk production unless that confidence is rekindled.

A more detailed SWOT analysis (strengths, weaknesses, opportunities and threats) of the dairy sector is included at the end of this section.

Practical ways to improve milk production over the next 10-20 years

UK dairy farmers could produce more milk if it were wanted, and if they were confident that they would be adequately rewarded. Increased supplies can be produced increasingly sustainably through improved and more consistent levels of on-farm performance, and through research into improved techniques.

Environmentally sustainable production requires maximum efficiency in the use of inputs, including land, energy, labour, steel and so on. Studies also show a wide range of performance among UK dairy farms. Through efficient use of inputs and by improving

management efficiency and applying best practice, many dairy farms could increase production, sustainability and profitability. In addition, new and continuing research is likely to lead to improved levels of best practice.

Outlined below are some areas where more consistent performance would have a major impact on production.

Feeding

Concentrate feed costs account for about 20% of total production costs on British dairy farms. DairyCo's work shows that feed conversion efficiency, which measures how much of the total feed going into the cow is converted to milk, can be improved by 8.5% at the farm level. These gains would increase milk yield and lead to a greater margin for farmers. Better use of feed would also reduce emissions of greenhouse gases per litre of milk.

Animal health

Reducing production losses due to disease, such as tuberculosis and Johne's disease, would have a large impact on milk production. A recent DairyCo study of 90 dairy farms calculated that the incidence of mastitis was approximately 71 cases per 100 cows per year. This incidence rate, on a national basis, is equivalent to a loss of UK milk supply of around 250 million litres a year, assuming all other factors remain constant. A realistic target would be to reduce this incidence rate by a third.

More generally, climate change is expected to increase the range of diseases and parasites challenging livestock. The control of animal diseases will be therefore of great importance in order to maintain or increase milk production.

Fertility

Poor management of cow fertility has a negative impact on annual average yields and cow numbers. The ideal calving interval is 365 days; however, data suggests that the average is nearer 419 days. If this slippage, which costs on average £2.50 per day per cow, were reversed, annual yield per cow would be improved by 7% while reducing cow replacement rates. This would again mean a higher level of production.

Grassland management

Grazed grass is the cheapest feed on most British dairy farms, yet often there is the potential to improve its utilisation in order to increase milk output from grass. For example, good management during the grazing period can improve milk output by around 2 litres per day per cow, through improvements in quality and palatability. This can lead to more milk for little, if any, additional input, thus improving efficiency and sustainability.

Nutrient management

Expanded nitrate-vulnerable zones, with increased regulations in them, will add to capital costs on many dairy farms. But there is the potential for some dairy farms to improve their use of the nutrients available in farmyard manure and slurry. Many farmers are already focused on this, but ensuring the best use of the available nutrients, and reducing reliance on artificial fertilisers, will improve profitability and sustainability.

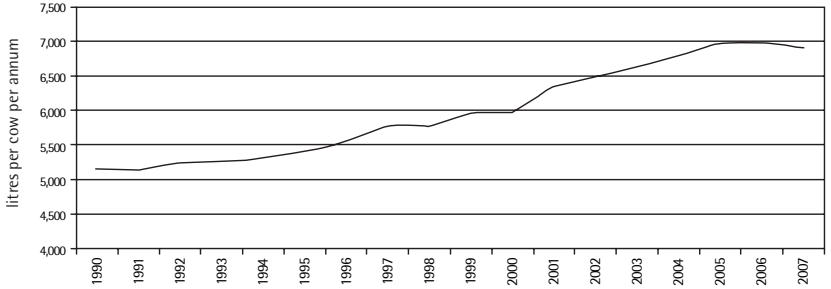
Research and development

R&D plays an important role in improving the performance of dairy farming. Particular areas for future research include the following:

Genetics

Genetic improvement can increase milk production in several areas, most obviously by improving milk productivity per cow. However, selecting strictly on yield would not be a sustainable breeding goal as health and welfare traits also need to be taken into account, despite the unfavourable genetic relationship that exists between the two.

Figure 3: National average dairy yield



Source: DairyCo

Genetic improvement explains more than 50% of the productivity improvements seen on UK farms over the past two decades.

If future selection is based on sustainable breeding goals, it is predicted that annual yield can be improved by 1,000 litres per cow over the next 20 years. Finally, genetics experts believe the use of biotechnologies (such as genetic modification, sexed semen, embryo transfer, geno-mics), when compared to conventional breeding methods, may accelerate genetic progress.

Soil management research

A 2008 report from the Royal Agricultural Society of England highlighted that most of the fundamental principles of soil management were well understood. However, it stressed that more applied research was needed in the areas of drainage, soil erosion control, soil structure, waste to land and irrigation. This research, and importantly its implementation by farmers, could improve production as well as the environment through enhanced water use efficiency, reduced flood risk and the better use of nutrients by crops. This means that more forage can be produced per hectare, more efficiently, and hence sustainably.

Crop research

Continued research is needed into ensuring that crops yield as much as possible from as few inputs as possible and are drought-tolerant. With warnings that yields of crops such as rice and maize in the subtropics could decrease by as much as 40% by the end of the century due to global warming, ensuring increased research into home-grown replacements for these crops will become more important if UK dairy production levels are to be maintained or improved.

Environmental effects

An improvement in a parameter such as feed conversion efficiency would mean that, for the same amount of milk produced, fewer cows would be needed, as well as less land, infrastructure and resources. This in turn would lead to reduced greenhouse gas emissions.

Many of the realistic and sustainable ways of reducing emissions from livestock are compatible with the efficiency improvements suggested above. However, they can only be achieved in partnership with effective knowledge transfer, whereby farmers can improve their farm management and get closer to best practice, and with sufficient R&D to keep UK dairy farming competitive and able to meet future needs.

Conclusion

UK milk production is declining. Some practical steps can be taken to reverse this trend in an environmentally sustainable way. However, the key to British dairy farmers wanting to increase productivity is improving confidence. This requires more stable profit margins and improved relationships within the supply chain. This calls for:

- **Positive farmers with good technical and management skills:** To implement appropriate techniques that could increase sustainable milk production requires confidence in the future and some degree of understanding and adaptation by farmers.

The nature of the dairy farmer's job is changing. As farms get bigger, the traditional family farm is being gradually replaced by bigger (though still mainly family-based) units requiring external labour. In these businesses dairy farmers need to have good management and technical skills. Many farmers have these, but access to and taking up a range of knowledge transfer facilities and education/training opportunities are key to improving those skills across the industry.

- **Improvement in the place of farming in UK society:** Farmers often feel that government decisions, but also society's expectations, suggest that food production in general and milk production in particular have not been a priority in the UK, with the emphasis instead on areas such as environmental protection. Production and environmental protection do not have to be mutually exclusive.

  If the UK wants to reverse the situation of declining milk production, an effort is needed to encourage more ambition in the industry by making the job of dairy farming more attractive and better perceived by society. Farmers require confidence that those buying milk are prepared to pay an adequate price for that milk. In return, farmers need the ambition to continue to improve efficiency and take advantage of knowledge transfer activities offered by many different parties.

SWOT analysis of the UK dairy sector

Strengths	Weaknesses
• Climate/location ideal for dairying • Large herd size (by EU standards) • High levels of production efficiency on some units • Heritage of fresh milk consumption	• Lack of new entrants and obstacles to entering the industry • Recruitment and retention of quality staff • Variable production performance – poor technical efficiency on some units • Change in nature of the dairy farmer's job, which is becoming a people management job. Lack of skills in this area • Poor training opportunities for the development of business skills • More emphasis put by the government (especially in England) on rural development rather than on food production • Image of dairy farming in society
Opportunities	**Threats**
• No constraints regarding quota (production below EU quota) • Availability of technical knowledge (DairyCo etc) • Low milk supply	• Risk of infections and disease, eg tuberculosis, bluetongue • Regulatory burden • Climate change • Reduction in government/EU support • Increasing global competition • Increasing milk price volatility • Significant number of farmers leaving the industry

Section v: Beef and sheep meat
Richard Lowe, Chief Executive of EBLEX

The current situation of the beef and sheep meat sectors

The combined gross output of the cattle and sheep sectors, at £2.3 billion, represents about 15% of UK agriculture as a whole. After taking into account the value of inputs (feed, veterinary costs and medicines etc), the two sectors' gross value added is about £800 million, equivalent to an estimated 0.07% of the UK economy (agriculture as a whole contributes about 0.5%). It is estimated that around 188,000 people are employed on livestock farms.

A SWOT analysis for the beef and sheep meat sectors (which appears in the EBLEX Corporate Plan for 2009-2012) is given at the end of the chapter. Key points include the following:

- **Strengths:** The cattle and sheep industry has a range of natural climatic and other environmental advantages that favour extensive animal production, combined with high production standards, and flexibility to meet a range of market requirements. The industry is broadly competitive on cost grounds with other EU countries.

- **Weaknesses:** Failure to exploit modern technologies, lack of collaboration, low profitability and reinvestment, and inefficient supply chains inhibit the industry's competitiveness and its sustainable development. Limited ability to add value to byproducts, net processing overcapacity and high regulatory costs are key weaknesses in the processing sector.

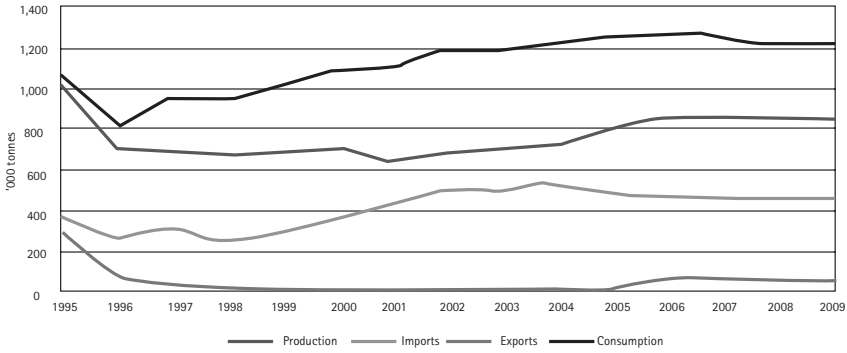
- **Opportunities:** Against a background of strong global demand for red meat, domestic and export demand for British product is robust (currently helped by the weak pound). There are significant opportunities to improve productivity, and for collaboration among producers and across the supply chain to improve competitiveness.

- **Threats:** Long-term external threats include animal disease outbreaks, competition from low-cost non-EU suppliers and climate change. Within the industry, rising production and regulatory costs and an ageing farmer population are serious challenges.

Figure 1 summarises the overall UK beef market balance since 1995. It shows the impact of the BSE crisis in 1996, which led to the removal of beef from over-30-month-old cattle from the human food chain, and the collapse of UK beef exports. Reduced domestic supplies and a strong recovery in beef consumption led to an increasing reliance on

imports. With the re-entry of beef from older animals into the food chain in 2005, domestic production has been substantially, though not fully, restored. As a result, the UK's self-sufficiency in beef fell from 109% in 1995 to 79% in 2007.

Figure 1: UK beef balance 1995-2009



Source: 1995-2007 figures from Ministry of Agriculture, Fisheries & Food/Department for Environment, Food & Rural Affairs; 2008-2009 figures are AHDB Meat Services forecasts

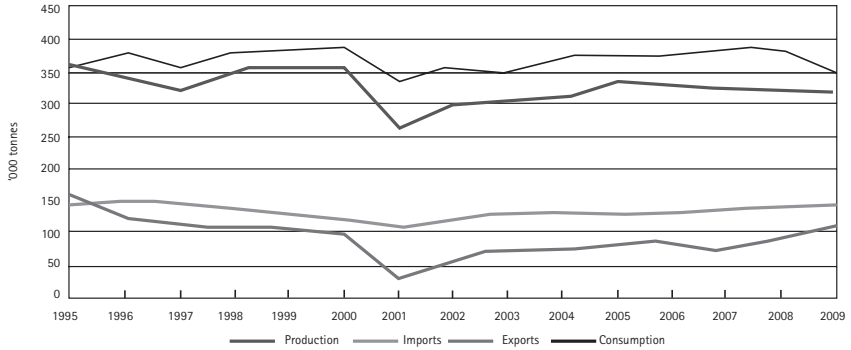
Beef is sourced – at present in roughly equal proportions – from both the dairy and suckler cow herds. Both of these breeding herds have been in steady decline for several years. While the dairy herd has been in comparatively faster and steadier decline, the suckler beef herd remained comparatively stable up until 1998, in part sustained by production-linked subsidies under the Common Agricultural Policy. The negative impact of the BSE crisis in the second half of the 1990s was followed by a period of partial recovery up to 2005, since when the suckler herd has declined, mainly owing to the impact of decoupling (the end of production-linked subsidies) following implementation from 2005 of the 2003 Common Agricultural Policy reform agreement.

Figure 2 summarises the overall UK sheep meat market balance since 1995. It highlights the adverse impact of the foot-and-mouth disease outbreak in 2001. Together with the decline in the UK sheep breeding flock, the UK's self-sufficiency in sheep meat has fallen from 103% in 1995 to 85% in 2007.

A number of historical and continuing factors combine to challenge the competitiveness and long-term sustainability of the UK cattle and sheep industry. These include: a chronic condition of low profitability, low producer confidence and lack of investment; market disruption caused by animal disease outbreaks; convoluted and inefficient supply chains;

net overcapacity in the abattoir sector; the large retailers' domination of the food supply chain; the administrative and cost burdens of legislation and regulation; and the impact of policy changes.

Figure 2: UK sheep meat market balance 1995-2009



Source: 1995-2007 figures from Ministry of Agriculture, Fisheries & Food/Department for Environment, Food & Rural Affairs; 2008-2009 figures are AHDB Meat Services forecasts

The implementation of Common Agricultural Policy reform in 2005 removed direct livestock production subsidies that had masked the real financial position on many livestock farms. While the decoupled single farm payment provides a cushion in the transition from production subsidies to a free, unsupported market, reliance on it can only be a temporary expedient. Despite relatively firm cattle and sheep prices during 2008, the marketplace has not adjusted to reflect the removal of direct production subsidies to provide a return to producers that adequately covers costs and allows for investment.

EBLEX's latest annual survey of production costs across a representative range of cattle and sheep production systems in England shows that, in the 2007/08 financial year, "average" performing producers – with the exception of store lamb finishers – failed to secure a positive net margin, though the top third performing producers in some systems did achieve a positive net margin.[1]

1 These results highlight the wide range of technical and business performance among cattle and sheep producers, the potential for improvement, and the importance of the knowledge transfer work of EBLEX in order to encourage best practice.

The outlook

Looking ahead, on current trends, the decline in the cattle breeding herd and the sheep breeding flock is forecast to continue. In the beef sector, this decline will of itself mean a continuing decrease in the supply of prime cattle for a period, since any turnaround is unlikely before 2011 because of the length of the beef production cycle. Any turnaround – in either the beef or sheep meat sectors – will to a large extent depend on whether producers have sufficient confidence to invest in their businesses.

Figures 3 and 4 indicate a range of projections of beef and sheep meat production against consumption to 2030 (import and export trade is excluded for the purposes of this exercise).

The analysis is based on the view that the body of scientific and technical knowledge on which significant improvements in meat and livestock production and productivity could, in principle, be made during this period is already in place. A necessary – though not sufficient – condition for such improvements to be realised is wider and more effective knowledge transfer activity that succeeds in achieving the uptake and application of that knowledge by the industry. In an industry comprising several tens of thousands of what are essentially small primary production businesses, this is a very real challenge.

The curves in the two graphs may be summarised as follows:

- The consumption line is based on a simple extrapolation of current per capita consumption and projected population growth in the UK.

- The "baseline" curve plots production based on a continuation of current trends in key technical parameters (including numbers of breeding animals, rate of genetic improvement, productivity, carcase weights, mortality, disease incidence and so on), as well as the prevailing commercial and policy environment.

- The "better" line plots production, based mainly on assumptions about feasible improvements in technical performance among primary producers. These assumptions relate to factors including: genetic improvements; improved nutrient management; higher calf/lamb output per cow/ewe (litter size is a particularly important parameter in the sheep sector); higher carcase weights; lower mortality; and more effective and collaborative actions to control animal diseases. The result is a higher supply of animals for slaughter and better use of abattoir capacity, as well as improved carcase and meat quality.[2]

2 In the sheep sector, improvements in technical performance, productivity and production are more likely to be realised in lowland sheep flocks.

In turn, these technical improvements should in principle also be accompanied by higher market returns, higher business confidence and greater investment.

- The "best" line plots what might be called a "perfect world", with production based on a faster and more comprehensive take-up by industry of the factors described in the "better" scenario narrative – that is, application of known state-of-the-art basic and applied research, successful and widespread knowledge transfer activity among producers, effective recruitment and retention of skilled stockmen, and best industry technical and business practice among producers. In this scenario the policy and regulatory environment is also conducive to maximising sustainable production.

These fairly simple scenarios cannot fully take into account changes in the range of variables at play in the real world. In practice, for example, across agriculture generally the goal of maximising output is strongly circumscribed by wider public policy considerations, including: protection of natural resources (soils, water, air), wildlife habitats and the aesthetic qualities of the countryside; protection of public health (for instance, the use of chemicals); protection and enhancement of animal welfare; and precautionary approaches in areas where there is public concern about more uncertain aspects of science (such as the use of GM technology in some areas of agriculture).

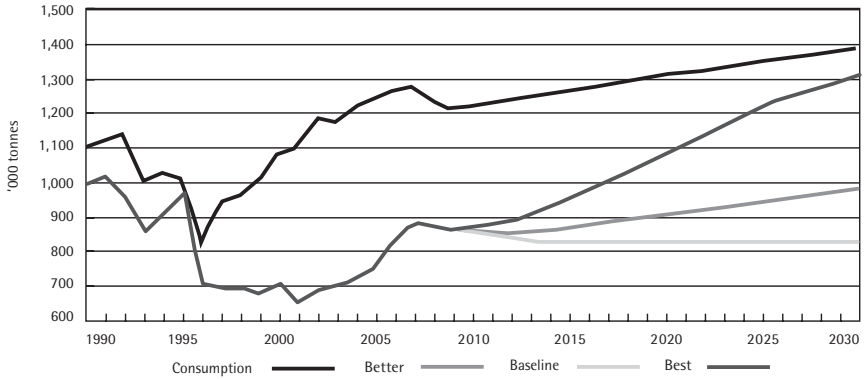
At the same time, wider global, EU and domestic economic, market and policy drivers also play a critical role in determining the extent to which UK producers are sufficiently competitive to invest in increased production and greater efficiency in order to meet a larger proportion of the UK's food needs.

Nevertheless, these production paths do serve to illustrate the range of long-term possibilities.

For beef, the graph highlights the substantial potential to increase production on the basis of the "best" and "better" scenarios, though even if either were realised there would be a continuing need for imports to meet projected consumption.

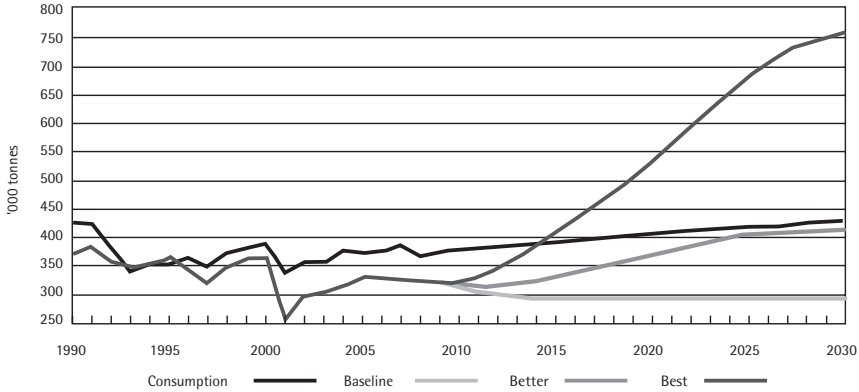
Similarly, for sheep meat, there is very great potential to increase production to substantially exceed (under the "best" scenario) or to come close to (under the "better" scenario) projected consumption.

Figure 3: Projected beef consumption and production trends to 2030



Source: Department for Environment, Food & Rural Affairs; EBLEX forecasts

Figure 4: Projected sheep consumption and production trends to 2030



Source: Department for Environment, Food & Rural Affairs; EBLEX forecasts

Conclusion

On the basis of existing knowledge, there is considerable potential to increase production and productivity in the beef and sheep meat sectors. But effective knowledge transfer is a key factor in realising this potential. Other factors include a more efficient supply chain, with better relationships across the supply chains.

Can government help? The government's key role is to provide a legal, economic, policy and regulatory framework that promotes the effective workings of the market, fosters fair competition and ensures strong infrastructure. It can also contribute to strengthening the competitiveness of the UK livestock sector, for example through the rural development programmes across the UK.

Looking further ahead, in a world challenged by population growth, climate change, and other pressures on natural resources, the government can also help to sow the seeds for future improvements in production efficiency through increased spending on long-term basic R&D and support for collaborative research with industry, as well as increased spend on applied R&D.

SWOT analysis of the UK beef and sheep meat sectors

Strengths	Weaknesses
• Availability of extensive grass-based grazing • Extensive production systems in sympathy with environmental requirements • Use of arable byproducts • Good animal welfare standards • A variety of breeds and production systems to meet differing domestic and export demand requirements • Comparable production costs and productivity with the rest of the EU • Ability to segment markets and to identify niche market opportunities • Strong independent whole-chain assurance schemes • Robust market demand for red meat	• Lack of collaboration among producers • Low herd/flock size • Poor nutrient management • Limited exploitation of advancing animal and plant genetics • Variable carcase quality • Low profitability among average-performing producers • Low level of reinvestment • Lack of skilled on-farm labour • Low producer bargaining power in the supply chain • Inefficient supply chains • Low ability to add value to animal byproducts • Processing overcapacity • High meat hygiene inspection costs
Opportunities	**Threats**
• Scope for improved productivity • Strong domestic consumer demand for "British" • Strong global demand for red meat • Export opportunities for some byproducts • Scope to displace imports	• Animal disease outbreaks • Rising production costs • Ageing farmer population and few new entrants • Sheep electronic identification • Declining domestic demand for lamb

• Scope for greater producer collaboration • Scope to increase the take-up of technological advances • Scope to improve marketing skills	• Economic downturn • Government cost-sharing plans • Low-cost non-EU suppliers • Climate change (adaptation and mitigation – pressures to reduce greenhouse gas emissions from livestock) • Single-issue pressure groups (anti-meat-eating, animal welfare, environmental) • Health issues (association of meat products with human disease (eg colorectal cancer)

Source: EBLEX Corporate Plan for 2009-12

Section vi: Pig meat

Mick Sloyan, Chief Executive of BPEX

The current situation of the pig sector

The gross output of the pig sector, at £700 million, represents a little under 5% of UK agriculture as a whole. After taking into account the value of inputs (feed, veterinary costs and medicines and so on), the gross value added is about £300 million, equivalent to an estimated 0.03% of national income (agriculture as a whole contributes about 0.5%).

A SWOT analysis (strengths, weaknesses, opportunities and threats) of the pig sector – which appears in the BPEX Corporate Plan for 2009-2012 – is given at the end of this section. Key points include the following:

- **Strengths:** The pig sector offers a wide range of fresh and processed products, produced to high animal welfare standards. Production efficiency is improving, and both production and processing are increasingly concentrated.

- **Weaknesses:** The eating quality of pork is variable. The sector's cost competitiveness has been undermined by the increased costs of high welfare systems, and market power lies with retailers. The sector is exposed to volatile global commodity feed markets.

- **Opportunities:** There is scope for differentiation and premiumisation, as well as for improvements in productivity and competitiveness. There is growing global demand for pig meat, especially offals and other lower-value cuts.

- **Threats:** Low business confidence is inhibiting investment, feed and energy costs are increasingly volatile, and in the economic downturn retailers are putting pressure on supplier prices. Globalisation of markets is intensifying intra-EU competition. Disease outbreaks are an ever-present threat.

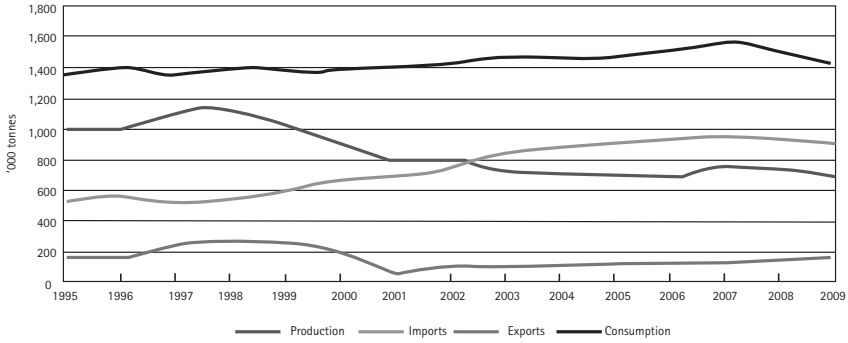
Consumption of British pork and pork products is robust. But over a protracted period the domestic industry has faced severe and sustained challenges to its competitiveness and viability arising from a range of factors. These include: substantial investment in high animal welfare production systems, to meet welfare standards under UK legislation that are above EU requirements, which have imposed additional costs and reduced price competitiveness; exotic animal disease outbreaks and endemic problems; increased imports (much of which are produced to animal welfare standards that are below UK standards); the administrative and cost burdens of environmental regulation (for instance, Integrated Pollution Prevention & Control, the EU Waste Directive and nitrate vulnerable zones);

strong retailer pressure on suppliers; and lack of transparency in the supply chain.[1]

These factors have reduced profitability, damaged business confidence, and resulted in a lack of investment in production systems and a shortage of skilled labour. In turn, they have inhibited the achievement of optimum technical and financial performance by producers and processors.

Figure 1 summarises the overall market balance for pig meat (pork and bacon combined) since 1995, with forecasts for 2008 and 2009. This shows the dramatic 35% fall in total UK pig meat production from its peak of 1.142 million tonnes in 1998 to 739,000 tonnes in 2007. This decrease was largely driven by the steady fall in breeding sow numbers and in productivity. As a result, the UK's self-sufficiency in pig meat fell from 73% in 1995 to 47% in 2007.

Figure 1: UK pig meat market balance 1995-2009



Source: 1995-2007 figures from Ministry of Agriculture, Fisheries & Food/Department for Environment, Food & Rural Affairs; 2008-2009 figures are AHDB Meat Services forecasts

With feed representing a substantial proportion of the total cost of producing a finished pig – reaching 60% during 2008 – pig producers have been particularly exposed to the dramatic increases in the level and volatility of global cereals and soya prices during 2007 and 2008. The cost of producing a kilo of pig meat peaked at just under 150p in April/May 2008, while the average loss per pig produced was at its greatest in January-May 2008 at between £20 and £25 per pig. Since then, declining costs and higher producer prices

1 The recent report of the House of Commons Environment, Food and Rural Affairs Committee into the English pig industry also highlights many of the challenges and problems facing the industry. The full report contains the written and oral evidence that BPEX gave to the committee during its inquiry.

meant that the industry moved back into profit in October. By November 2008, average production costs were down to 128p per kg of pig meat, giving a net profit of £4 per pig.

The outlook

Looking ahead, on current trends, the breeding herd is expected to remain broadly stable. There are encouraging signs of an increase in productivity. This points to increasing production efficiency by those producers who are choosing to make a long-term commitment to the pig industry.

Figure 2 sets out a range of projections of production against consumption to 2030.

The consumption line is based on a simple extrapolation of current per capita consumption of pig meat and projected population in the UK. The production projections are based on alternative scenarios of how production might develop, largely on the basis of current scientific and technical knowledge and – very importantly – on the extent to which this knowledge is taken up and applied by industry. The structure of the pig industry is quite different from that of the more extensive cattle and sheep industries, being more vertically integrated, and is in some respects more conducive to the spread and take-up of scientific and technical knowledge. Nevertheless, the challenges of knowledge transfer activity should not be underestimated.

For each of the production curves, key assumptions revolve around the size of the breeding herd, average carcase weights, and pigs sold per sow per year.

The "baseline" curve plots production based on a projection of current trends and technical performance; notably, no change in the size of the breeding herd or in carcase weights, and some growth in productivity to around 2013 that subsequently remains fairly static.

The "better" curve plots production, mainly based on:

- the assumption of a stable breeding herd;
- year-on-year increases in carcase weights to 85kg or higher (achieving these higher carcase weights is largely contingent on success in dealing with the problem of boar taint that may occur in some pig meat, while remaining consistent with the practice of non-castration in the UK); and
- higher numbers of pigs born, weaned and sold per pig through improved genetic selection and herd management, higher nutrition, staff training, higher investment in facilities, and higher herd health (partly through the wider use of existing vaccines and greater investment in the development of new ones).

The "best" curve plots what might be regarded as a "perfect world" – albeit unlikely to be realised – based on:

- a year-on-year increase in the breeding herd;
- the faster and wider capture of the other improvements described above to secure faster and higher increases in carcase weights and productivity than under the "better" scenario;
- long-term commercial contractual arrangements that encourage investment, contributing to higher production and productivity; and
- a policy and regulatory environment that is conducive to maximising sustainable production, or at least does not further inhibit the expansion of pig production units.

Each of the production projections assumes no new health challenges in the pig sector. They also assume that there is adequate and stable availability of cereals and other feed for inclusion in pig rations (including a level of demand for biofuels that does not threaten the availability of cereals).

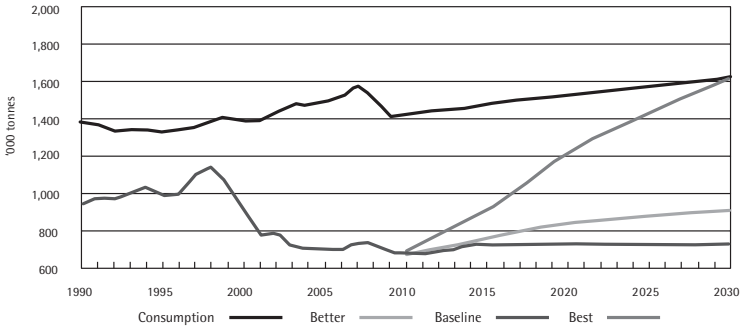
As with other discussions on the outlook for individual agricultural sectors, these fairly simple scenarios cannot take into account all the factors that will influence real events and outcomes. In reality, a goal of maximising output is circumscribed by wider public policy considerations, including: protection of the environment and natural resources (soils, water and air); protection of public health; protection and enhancement of animal welfare; and precautionary approaches in areas where there may be public concern about more uncertain or less well-understood aspects of science (such as the use of GM technology in some areas of agriculture).

In addition, wider global, EU and domestic economic, market and policy drivers play a critical role in determining the extent to which UK producers are sufficiently competitive to invest in increased production and greater efficiency in order to meet a larger proportion of the UK's food needs.

Nevertheless, the production paths outlined do serve to illustrate the range of long-term possibilities.

Figure 2 highlights the enormous potential to increase production under the "best" and "better" scenarios, though under the "better" scenario there would be a continuing need for significant imports to meet projected consumption.

Figure 2: Projected pig meat consumption and production trends to 2030



Source: Department for Environment, Food & Rural Affairs; BPEX forecasts

Conclusion

On the basis of existing knowledge, and under favourable economic, commercial and policy conditions, there is considerable potential to increase production and productivity in the UK's pig industry.

The realisation of this potential largely lies in the hands of the industry itself. But there are also some important steps the government can take to assist, including:

- maintaining or increasing funding of long-term research and development, and supporting collaborative research with industry;
- better regulation; supporting the competitiveness of the pig industry through rural development programmes;
- encouraging a more effective EU regulatory regime for GM animal feed ingredients;
- promoting a clearer consumer labelling regime, which helps consumers to better understand the quality attributes of British product; and
- facilitating, where appropriate, a more efficient supply chain.

SWOT analysis of the UK pig meat sector

Strengths	Weaknesses
• Robust market demand for pork and pork products • Price points favourable compared with other meats, especially beef and lamb • Good range of formats, from fresh pork to a variety of processed products • Growing reputation for high welfare and local production • Growing concentration in production and processing and some willingness to invest • Steady improvement in production efficiency, thanks to new vaccines and investment	• Fresh pork has a rather traditional image that constrains further growth • Investment in higher welfare system and a lack of investment in previous years has undermined cost competitiveness • Eating quality of pork can be variable with no online method of measurement • Imbalance of market power between retailers and the remainder of the supply chain • Dependence on increasingly volatile global commodity feed markets
Opportunities	**Threats**
• Considerable scope for differentiation and premiumisation • Price and product range to exploit the economic downtown • Scope for further improvement in productivity and competitiveness • Growing demand on a global basis, especially for offals and lower-value cuts	• The financial crisis is causing retailers and food service companies to put pressure on supplier prices • Globalisation of markets, resulting in the EU losing market share and intensifying intra-EU competition • Confidence to invest undermined by the prospect of poor or negative margins • Single-issue pressure groups • Increasing volatility in feed and energy costs • Disruption caused by animal disease outbreaks

Source: BPEX Corporate Plan for 2009-2012

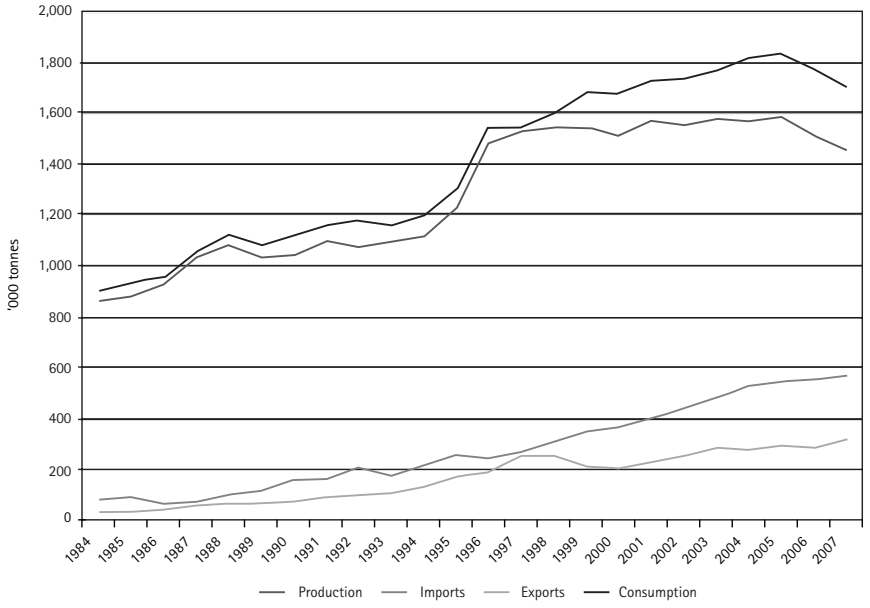
Section vii: Poultry meat

Peter Bradnock, Chief Executive of the British Poultry Council

Current market

Poultry meat is the UK's most popular meat protein, with annual consumption exceeding 1.7 million tonnes. It accounts for nearly half of the volume of all primary and cooked meats sold at retail. Consumption, predominantly of chicken, has grown over the last 20 years by 62%. In the same period production grew by 42%, with the difference being made up by a huge increase in imports, mostly of boneless chicken breast meat. Total imports from within the EU and from Brazil and Thailand have risen more than sixfold in the past 20 years, moving from just 7% to 33% of total consumption in 2007.

Figure 1: UK poultry meat sector



Exports, mostly of parts not attractive to British consumers, have also increased considerably in volume and as a proportion of total UK production, indicating greater penetration of imported poultry meat in UK consumption.

British production and some EU imports supply a mainly primary fresh retail market and some poultry meat preparations, with non-EU frozen and cooked frozen imports mostly going into food service and some retail ready meals, preparations and value lines.

The strong annual growth in production plateaued in the past five years, and in the past two years both production and consumption have actually declined, despite a continued rise in imports.

The UK pattern of long-term growth in poultry meat consumption is reflected across the EU and other developed countries. Another common trend has been the relative decline in share of total world production within developed countries in favour of very rapid growth in production in developing countries as their populations become more affluent and as access to developed markets has opened the door to global sourcing of poultry meat.

Strengths

Modern chicken production is largely founded on increasingly sophisticated genetic selection programmes. UK breeding companies responded to particular requirements of the UK market by producing genetic strains or products whose characteristics soon proved attractive to producers in other countries, leading to a strong export market in poultry genetics. The big productivity gains encouraged massive investment in new production in developed and developing countries, particularly where there was ready access to domestic feed crops, and prompted the international trade in chicken as a global commodity.

Forty years ago selection was for only one or two "production" traits, mainly liveweight. Today more than 40 traits are selected for, made possible by advances in genetic theory, in methods for more accurate and reliable measurements, and in computer power necessary to track and analyse huge amounts of data for large numbers of birds.

The heavy investment in breeding science and technologies needed to succeed has seen the number of significant commercial chicken breeding companies across the world drop to just three, but the range of genetic "products" available from each to meet particular market requirements has been maintained – including unselected lines – contrary to some concerns about possible loss of genetic diversity.

Major productivity and environmental benefits have been achieved over the last 40 years. The number of chicks per breeder hen has increased by around 30%. Feed and water consumed for every kilogram of live weight of meat chicken have decreased by more than 30%, and the average daily weight gain has doubled over the period. Conformation has

changed to significantly higher breast meat yield, and total body fat has almost halved. Improvements in the house environment, nutrition and stockmanship have contributed to these gains.

Another major factor in the development of the sector is that it has always been entirely market-driven, without Common Agricultural Policy production subsidies distorting market signals, and with the positive influence of retailers in development of products and quality standards demanded by consumers. This has engendered a very short and largely vertically integrated and concentrated production chain. The short production cycle, and the hygiene control and relative uniformity of output possible with indoor rearing systems, have enabled real benefits in disease prevention and food safety. They have also allowed a high degree of mechanisation in the slaughter and processing operations, with long-term unit cost reductions.

All of these strengths are reflected in UK poultry meat having a comparatively low global warming potential. Under climate change agreements with the Department for Environment, Food & Rural Affairs, the poultry meat sector has cut primary energy use per tonne of liveweight by a third in the past eight years.

Other environmental benefits include a relatively low level of embedded water in poultry meat consumed, even compared with some grains such as rice. Indoor rearing allows greater control over manure and its disposal and around two-thirds of UK poultry litter is used as a renewable resource to generate electricity.

Weaknesses

The success of the commercial breeds has led to standardisation of systems and products and the globalisation of poultry meat, particularly chicken, as a commodity product. It is difficult for UK producers to differentiate their products, grown and processed according to different sets of social values and regulations, from the world commodity products without having to set up elaborate and expensive labelling schemes for consumers to be able to make distinctions in their buying preferences.

It might be argued that in some sectors of the market which are almost entirely domestically supplied, such as fresh poultry meat, expensive labelling schemes simply add to the cost of all poultry meat, without distinction and without increasing sales volumes. This is not a particular weakness of the poultry sector, but points to a need to reassess the real benefits of assurance schemes to consumers in some sectors where there is no significant variation in the product on offer.

Some would see a weakness in poultry meat companies not collaborating on joint programmes to generically promote the product to consumers and to convey a strong and positive image to the public. This healthy individualism derives from the entrepreneurial nature of the sector leaders, the competitiveness of market-driven production, and the absence of statutory levy organisations to carry out promotional activity. A less than positive public image makes it harder to attract and retain talented people in the sector, which has become more dependent on a migrant workforce.

Opportunities

The greatest opportunity for the sector is to continue to build on its strengths, and to confidently communicate these to consumers and the public, along with the wider benefits they bring.

Continued improvements in the bird environment on farms, and the development and take-up of feed grain varieties bred specifically for the needs of poultry, could help realise more of the existing genetic potential of the breeds. Selective breeding is drawing on the newer science of genomics to provide more rapid identification and selection of traits, enabling fewer birds to be included in breeding programmes.

Consolidation of farms and of processing facilities will continue, as will the concentration of ownership (including across EU national boundaries) of processing and the strategic control of production across all production systems and market presentations. However, some market sectors will adopt stronger national identities as EU rules on provenance and processing treatments become more transparent.

Threats

The long-term production capacity and financial viability of the UK poultry sector is threatened by discriminatory legislation and retailer practices that add cost, reduce competitiveness and limit reinvestment. EU legislation on animal welfare and environmental protection is not required of producers and processors in non-EU countries, and this is a factor in the growing substitution of domestic production by imports over recent years. The UK government policy of enforcing certain EU legislation through agencies that recover their full costs through charges on the sectors they regulate imposes costs on UK producers and processors often not carried by competitors in the rest of the EU or in non-EU countries exporting to the UK market.

UK retailers are imposing additional costs on UK poultry meat producers through the discriminatory requirement that feed for poultry (but not for other livestock) contain only non-GM ingredients. It is increasingly difficult to source non-GM ingredients, as the main

producing and exporting countries increasingly plant GM crop varieties. Growing financial premiums paid to shippers are failing to ensure segregation of non-GM from GM product, and are discrediting the integrity of non-GM supplies. The retailers' present policy is unsustainable.

UK poultry meat producers and processors are further discriminated against by the generally higher retail margins applied to poultry meat compared with margins on competing meats. The strong potential price competitive advantage of poultry meat is not fully available to all consumers.

The widespread move to GM crop varieties in the world's major producing countries is underpinned by effective and timely approval systems 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 huge threat to supplies of certain animal feed ingredients essential to EU poultry production, as well as ingredients widely used in food products in the EU. 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.

This problem will hit almost all feed and food sectors. It is clear that the EU can no longer assume that non-EU countries will be willing or able to adopt different and increasingly onerous crop production requirements solely to accommodate the EU.

Other threats come from the UK government's intention to create a new non-ministerial department responsible for animal health policy and delivery in England, but not in Scotland or Wales, with animal welfare remaining with the Department for Environment, Food & Rural Affairs. The secretary of state is proposing to pass responsibility for animal health in England to an appointed board. This will make the decision process more complex and administratively burdensome, but still based on the same science and within the same constraints now imposed by the EU legislative framework. There will be pressure for the costs involved to be passed on to England's livestock keepers through the levies presently envisaged to pay for exotic disease outbreaks. This approach is disjointed, distorted and discriminatory.

Sustainable food production

Policies for increasing production of sustainable UK food need to concentrate on encouraging consumption of meat species and on production systems that minimise carbon-equivalent impact on the environment and ensure efficient use of natural resources such as land and water per kilogram of meat obtained. Poultry meat is one of

the most environmentally and economically sustainable meat production systems. Switching to eating indoor reared poultry meat achieves a 75% reduction in the impact on global warming from meat eating. Even a partial switch would produce significant relative reductions.

However, policy makers need to bear in mind that consumption of livestock products in the UK contributes only 8% of UK total greenhouse gas emissions, with poultry meat contributing just 1%. Policies aimed at excluding livestock products from UK diets, even if they were to succeed, would result in a comparatively small net reduction in total greenhouse gas emissions.

Demand for poultry meat will resume a growth trend, and increases in UK production could recover some of the import substitution of recent years or at least meet new demand. The main constraints on increasing poultry meat production will not be in the scientific, productive or processing efficiency categories. They will be in those areas already outlined – in the administrative and cost burden of regulation and its discriminatory application, the difficulty in financing new investment from low margins, the cost of obtaining planning and environmental approvals, the policies and practices of retailers, and the sirens of "alternative" systems.

The poultry sector provides many advantages in efficient and sustainable production of consistently safe and affordable food, and in compliance with an elaborate and growing framework of regulation and codes of practice and training that protect and promote bird health and welfare.

In volume terms, UK poultry meat production almost equals that of beef, pork and sheep meat added together. Yet there is almost no recognition in policy or public of these achievements by the government and ministers most concerned with the security of food supplies. Ministers should be encouraging and championing this highly productive enterprise that delivers sustainable food to the UK population by clearing away impediments to expansion of efficient farms and processing facilities.

Section viii: Sea fish

John Rutherford, Chief Executive of the Sea Fish Industry Authority

The tragedy of the commons

Fundamental to managing fisheries is the issue of who benefits from any conservation measures. If one group of fishermen chooses to avoid catching a particular stock – say, because they know it has a relatively high proportion of immature fish, which they wish to allow time to grow to a larger size and weight – they risk watching those same fish being killed lawfully by other fishermen who are not prepared to delay.

The UK is subject to the EU Common Fisheries Policy, which states a common objective:

... to provide for sustainable exploitation of living aquatic resources and for aquaculture in the context of sustainable development, taking account of the environmental, economic and social aspects in a balanced manner.

Recent evidence shows that British fishermen have recognised the need to adopt sustainable fishing practices and have led the way, for instance in aspiring for Marine Stewardship Council accreditation for the sustainability of mackerel, herring, nephrops (langoustine/prawn) and haddock in the North Sea. The UK adopted forensic control measures in 2006 (registration of first buyers and sellers), following the money onshore for the first time.

Political will is required to deliver sustainable fisheries globally and throughout the EU. The UK is showing that where this will exists – albeit not without immediate cost to fishermen – depleted fish stocks can recover, subject to the additional vagaries of global warming. Cod recovery in the North Sea is being recognised now and rewarded with increased quota for UK fishermen for 2009.

The UK imports what we eat and exports what we catch

In 2007 the UK exported seafood valued at almost £1 billion and imported £1.9 billion worth of seafood products. And it would appear we are consistently unadventurous in our taste and choices, sticking with the species we know and love instead of trying something different.

Together with most of Northern Europe, the British have a historic appetite for cod, virtually all of which now is imported from Icelandic and Norwegian waters, and other white fish (gadoid) species such as haddock, whiting, hake and halibut. Approximately three-quarters of the seafood eaten in the UK is imported.

Paradoxically, two-thirds of the British catch is exported. This is because we do not have a large appetite for the most healthy, omega 3 oil-rich, pelagic species such as herring and mackerel, nor for commonplace crustaceans such as brown crabs, scallops and spider crabs.

The single most valuable catch species in the entire UK – worth £127 million in 2007 – is langoustine/prawn. In Britain, only the tails of these shellfish are traditionally served, as "pub grub" scampi, whereas in Europe the whole animal is highly valued. An increasing proportion of the 44,000 tonnes landed in the UK is exported live to Italy, France and Spain to be envied and enjoyed by sun-seeking British holidaymakers.

Other British species enjoying popularity abroad include salmon, mackerel, herring and monkfish. France and Spain are the UK's biggest customers, importing 39% of UK seafood, worth £386 million in 2007.

The issue of discarded fish

The absolute weight of discarded fish can only be estimated. However, recent trials suggest that around 40% of the total catch weight of popular species such as cod, haddock and whiting trawled in the North Sea may be discarded, for two main reasons.

First, the fish caught may have little or no market value, because:

- they are completely non-commercial and have no economic value;
- they are of a marketable species but of low value and not worth keeping; or
- they are damaged or of such reduced value that they are not worth keeping.

Second, fish may be discarded because of management regulations ("regulatory discards"):

- they are of commercial species but below the legal minimum landing size ;
- they are restricted by quota, so there is no entitlement to land them; or
- they are non-marketable because of rules controlling the relative proportion of species that may be landed.

A combination of market forces and regulations may also result in "high grading"; that is, the discarding of fish that are valuable, but not as valuable as (usually) larger fish of the same species. High grading usually applies only to quota-controlled stocks, in particular herring and mackerel caught by British boats in EU waters.

"No discards" – the opportunity for food

Norway banned the discarding of unwanted fish over 10 years ago. While many British fishermen claim it is unworkable, there is little doubt that this policy has reduced discards in Norwegian waters substantially. After initial resistance from Norwegian fishermen, they are now championing the policy as the way in which all fisheries should be regulated. In the most recent (December 2008) review of quota-sharing negotiations between Norway and the UK, agreement has been reached in principle for a common adoption of zero discards in fisheries shared with Norway.

The essence of this policy is that if any fish are caught, they must be landed, regardless of economic value. If they are quota species for which no quota is available, quota can be bought retrospectively, or the authorities might confiscate the fish. In any case, the fishermen incur costs of storage, care of the catch and carrying it home. If the values then realised are un-economic, they quickly find methods to avoid catching unwanted fish – the environmental objective.

And in any event, fish that otherwise would have been dumped are a valuable protein source. Fish is food, and there is little – skin, bones and offal – which is not treated as such in some part of the world.

Learning to love fish

Fin-fish and shellfish make up a magnificent seafood offer in terms of taste, texture, colour, variety and size. The challenge for 21st-century Britain is to learn to love less-familiar wild-caught species, rather than simply traditional cod and haddock. While the popularity of celebrity chefs and cooking programmes has had an impact on adventurous shoppers, on a day-to-day basis British people are fairly unswerving in their buying behaviour.

Consumer preferences are shifting away from whole fish. For those who have never learned to cook, the immediate priority is simply to remove the negative aspects, the fear of skin, bones and smell associated (wrongly) with fish. When it comes to seafood, most British people stick to their favourites – mild-tasting white fish – rather than experimenting with the options on their doorstep. Meanwhile, Europeans covet our oil-rich fish and shellfish, paying top prices for it on the export market.

Retailers report increasing consumer resistance to whole fish, especially for smaller flatfish where processing options may be more limited. Fresh or defrosted (refreshed) "wet-fish" continues to lose market share (now less than 25%) to processed and frozen product. More generally, the successful foods are those that can match people's needs,

particularly in terms of light meals, easy meals, quick meals and snacks. These trends will fuel demand for quality, highly fresh fish, which forms the base for premium chilled products (such as fresh fish portions) that compete with other "healthy" proteins such as chicken.

Finally, there is the issue of portion size; particularly in Britain's fish and chip shops, where portion sizes are commonly in excess of 175g of whole flesh, and sometimes for instance "jumbo haddock" will be advertised, at a 400-500g portion size. An adequate and healthy portion as part of a varied, healthy diet in which seafood features twice a week should be in the range of 100-140g only, thereby spreading the available resource among potentially 50% more meal opportunities.

Aquaculture

Worldwide, wild fish capture has stood at nearly 100 million tonnes for the past decade, and looks to be sustainable under normal circumstances at or around this figure. At this level and with reasonable estimates of aquaculture growth, the total world fish/seafood protein availability will be close to half of land-animal protein.

The global increase of fish (including prawn) consumption has been fuelled by modern techniques in fish farming. To a large extent, all the technical and environmental issues can now be mitigated, with the possible exception of damage to sea cages resulting in cultivated stock escaping into the wild.

In its *State of World Aquaculture 2006* report,[1] the Food & Agriculture Organization states that world aquaculture has grown tremendously during the past 50 years, from a production of less than 1 million tonnes in the early 1950s to 59.4 million tonnes by 2004. According to Food & Agriculture Organization projections, it is estimated that global aquaculture production will need to reach 80 million tonnes by 2050 in order to meet the current level of per capita consumption. Aquaculture has the potential to make a significant contribution to this increasing demand for aquatic food in most regions of the world, says the report; however, in order to achieve this, the sector (and aqua-farmers) will face great challenges.

Aquaculture already accounts for more than half of all wild-capture fisheries. With technological and science-based solutions increasingly available, growth projections to 100 million tonnes seem achievable within the next generation. Pangasius is the most recent and least known example of what modern, vegetable-based aquaculture can

1 Food & Agriculture Organization *State of World Aquaculture 2006*, FAO Fisheries technical paper no 500 (2006)

deliver. Starting from zero barely 20 years ago, Vietnamese commercial sales broke through 100,000 tonnes in 2000, exploding to over 1 million tonnes in 2007. With growth forecast beyond 2 million tonnes over the next three years, pangasius or "basa" is already a staple lower-cost alternative to more expensive, traditional white fish species.

European fin-fish farmers produced just under 1.6 million tonnes in 2007, with Norway the dominant producer (841,000 tonnes, 53% of European production), largely due to its salmon industry. The UK ranks second in Europe, with a combined fin-fish production of 159,000 tonnes. UK production was dominated by salmon (89%) and trout (10%), with sea bass, turbot and halibut contributing the remainder. Much of UK salmon production is now under Norwegian ownership, and with conflicting environmental pressures constraining new site availability in Scotland, it is unlikely that farmed fin-fish production will increase substantially in the UK in future.

UK farmed shellfish production is dominated by mussels (26,000 tonnes), with oysters second (at only 1,250 tonnes in total). Shellfish is cultivated all around the UK coastline, with nearly 40% coming from Welsh estuaries, much of this production being exported. Again, competition with tourism and leisure activities for available water limits future growth, and may even threaten established, successful businesses.

Conclusion

Technology offers marine farming solutions that can make a substantial contribution towards feeding a hungry world. Geography, climate and environmental sensitivities suggest that the UK will play only a small part on the global stage but could divert a greater proportion of exceptionally healthy, oil-rich seafood to our own domestic market.

Avoiding waste and embracing the diversity of wild-capture fisheries, even within our own area of EU shared seas, could also improve our national diet and reduce the balance of trade deficit, but would still leave a substantial reliance on imports for both traditional and more exotic species.

Table 1: Fish landings by UK vessels 2007

	Volume ('000 tonnes)	Value (£m)
Nephrops	44.5	128.7
Mackerel	133.8	89.0
Crabs	32.9	42.7
Haddock	33.5	40.8
Monks or anglers	15.9	39.1
Scallops	20.8	38.9
Lobsters	2.8	31.6
Cod	19.3	29.9
Herring	91.1	26.3
Sole	2.9	21.2
Plaice	13.2	15.9
Whiting	13.2	11.8
Megrims	4.0	9.5
Lemon soles	2.5	7.8
Squids	2.6	7.7
Total pelagic	**260.1**	**127.9**
Total demersal	**204.5**	**236.6**
Total shellfish	**145.8**	**280.3**
Total all species	**610.4**	**644.8**

Source: HM Revenue & Customs

Figure 2: UK fish exports 2007

	Volume ('000 tonnes)	Value (£m)
Salmon	56.1	182.1
Mackerel	97.8	83.3
Cod	15.6	46.1
Anglerfish	3.6	24.8
Herring	55.5	20.8
Megrim	3.8	13.5
Sole	1.3	9.6
Haddock	3.4	8.9
Tuna	3.6	8.4
Hake	2.5	7.8
Sardines	14.8	7.8
Saithe	5.8	4.5
Halibut	1.0	2.9
Whiting	1.3	2.1
Trout	0.2	0.8
Plaice	0.4	0.5
Other demersal and pelagic	58.2	88.7
Total fin-fish	**324.9**	**512.7**
Crabs	14.8	37.7
Cockles and mussels	14.9	10.8
Prawns (Pandalidae spp)	1.3	7.0
Oysters	1.0	2.3
Other shrimps and prawns	21.6	79.5
Other crustaceans	24.4	152.4
Other molluscs	28.4	106.7
Total shellfish	**106.4**	**396.6**
Grand total	**431.3**	**900.2**

Source: HM Revenue & Customs

Chapter 3

The global food context

Wilfrid Legg, Head of the Policies & Environment Division in the Agriculture Directorate of the Organisation for Economic Co-operation & Development

The global food context

In 2008, the Organisation for Economic Co-operation & Development and the Food & Agriculture Organisation of the United Nations published their annual *Agricultural Outlook 2008-2017* report. This was the 14th *Outlook* report and the fourth produced jointly between the two. Based on a set of policy and macroeconomic assumptions relevant at the time, and drawing upon the commodity, policy and country expertise of both organisations, the report aimed to provide an assessment of future prospects in the major world agricultural commodity markets.

The 2008 *Outlook* offered an assessment of agricultural markets covering cereals, oilseeds, sugar, meats, milk and dairy products over the medium term. By including an analysis of and projections for global biofuel markets for bioethanol and biodiesel for the first time, the interactions between these markets and those for the main agricultural feed stocks were spelled out.

The underlying assumptions regarding macroeconomic factors, oil prices, agricultural and trade policies, production technologies and average weather conditions were those pertaining in early 2008. On that basis – and those assumptions will have changed for the preparation of the upcoming 2009 edition – the *Outlook* presents a plausible scenario for the evolution of agricultural markets over the next decade and provides a benchmark for the analysis of agricultural market outcomes that would result from alternative economic or policy assumptions.

The 2008 *Outlook* took place against a backdrop of exceptional increases in prices for many agricultural commodities, which has changed the way in which we must consider medium-term projections. In particular, we need to assess the "durability" of the various influences shaping the future evolution of prices. That is, which of the factors that drove up prices were temporary and which will prove to be more permanent influences? How will they individually and collectively affect price levels, price trends and price volatility in the future? How will markets react to a more uncertain price outlook? And what are the appropriate policy responses?

Thus, the discussion of the 2007-08 food price increases, their causes and their likely consequences for agricultural markets, as well as for the policy formulation process, is one of the most pressing in the global food context.

Permanently higher prices

At the time of publication, nominal world prices for almost all major traded agricultural

commodities were at or above previous record levels (although not in real terms). However, the report concludes that this will not last, and that prices will gradually come down because of the transitory nature of some of the factors behind the price hikes. But there is strong reason to believe that there are now also permanent factors underpinning prices, which will work both to keep them at higher average levels than in the past and to reduce the long-term decline in real terms.

Whether transitory or permanent, appropriate policy action for agricultural development and for addressing the needs of the hungry and the poor must take account of both these characteristics.

The dramatic increase in prices was partly the result of adverse weather conditions in major grain-producing regions in the world, with spillover effects on crops and livestock that compete for the same land. In a context of low global stocks, these developments alone would have triggered strong price reactions. These conditions are not new; they have happened in the past and prices have come down once more normal conditions prevail, and supply does respond over time. This trend is likely to recur over the next few years and so some effects of the price increases are likely to be cyclical. According to an old adage, the best remedy for high prices is high prices. High prices stimulate supply and dampen demand on agricultural markets – the balance changes and prices fall.

Since the 2008 *Outlook*, prices have fallen from their peaks, but will remain at higher average levels over the medium term than in the past decade. But the underlying forces that drive agricultural product supply (by and large productivity gains) will eventually outweigh the forces that determine stronger demand, both for food and feed, as well as for industrial demand, most notably for biofuel production. Consequently, prices will resume their decline in real terms, though possibly not by quite as much as in the past.

On the supply side, the *Outlook* expected continued yield growth for crops to be more important than new areas brought into cultivation in determining crop supply. Slowly increasing dairy and livestock yields will also support the increase in milk and meat production. A key assumption in the *Outlook* was some strengthening of the US dollar against most currencies. In the countries affected by this change, this will reinforce domestic price incentives to increase production. These factors will combine to sustain the growth of global agricultural production, although some of that impetus will be abated by the supply-reducing effect of high oil prices in 2008 – a key factor that raised production costs. Oil prices have since decreased.

On the demand side, changing diets, urbanisation, economic growth and expanding

populations are driving food and feed demand in developing countries. Globally, and in absolute terms, food and feed remain the largest sources of demand growth in agriculture. But stacked on top of this is the rapidly growing demand for feed stock to fuel a growing bioenergy sector. Biofuel demand was the largest source of new demand in decades and a strong factor underpinning the upward shift in agricultural commodity prices in 2007-08.

As a result of these dynamics in supply and demand, the 2008 *Outlook* suggests that commodity prices – in nominal terms – over the medium term will average substantially above the levels seen in the past 10 years. These levels are, however, conditional on the strong global economic growth and high crude oil price assumptions that prevailed in the beginning of 2008. Over the *Outlook* period, prices will resume their decline in real terms, albeit at a slower rate. However, the impact of various supply and demand factors on prices will differ across commodities.

In addition, prices may also be more volatile than in the past: stock levels are not expected to be replenished substantially over the medium term; demand is becoming less sensitive to price changes at the farm level as the commodity share in the final food bill falls and as industrial demand grows; weather conditions and agricultural product supply may become more variable with climate change; and speculative non-commercial investment funds enter or leave agricultural futures markets as profit opportunities dictate.

Within this overall context, the epicentre of global agriculture will further shift away from the OECD nations and towards developing countries. Both consumption and production are growing faster in developing countries for all products except wheat. By 2017, these countries are expected to dominate production and consumption of most commodities, with the exception of coarse grains, cheese and skim-milk powder.

Corresponding shifts are also occurring in global trade patterns. Imports are growing most in developing countries, and an increasing share of this growth is captured by larger exports from other emerging and developing countries. Export growth in developing countries is greater, and sometimes very much so for almost all products. However, while the share of OECD countries in world exports overall falls, these countries continue to dominate export trade for wheat, coarse grains, pork and all dairy products.

High prices are good for some and bad for others. They are beneficial for many commercial producers in both developed and developing countries. However, many farmers in developing countries are not linked to markets and will draw little or no benefit when prices are high. But the poor, and in particular the urban poor in net food-importing developing

countries, will suffer more. In many low-income countries, food expenditure averages over 50% of income and high prices push more people into undernourishment.

For the least developed countries, especially the food-deficit group, the projections thus show greatly increased vulnerability and uncertain food supplies during an era of high commodity prices and high price volatility. This underscores the importance of developing these countries' domestic supply capacity by improving the overall environment in which agriculture operates through enhancing governance and administrative systems and investing in education, training and extension services, research and development, and physical infrastructure. While these are longer-term remedies, it is important in the short term that commodity trade functions efficiently to facilitate the allocation of available commodity supplies.

The actual evolution of agricultural commodity and food prices, however, hinges on future policy developments.

Trade-restricting policies such as export taxes and embargoes may in the short term provide some relief to domestic consumers but in fact impose a burden on domestic producers and limit their supply response, as well as contributing to global commodity market uncertainty. Similarly, protecting domestic producers of agricultural commodities through border measures imposes a burden on domestic consumers; it would also restrict growth opportunities for producers abroad.

Key factors behind the price spikes

A number of temporary and permanent factors have been identified that help in understanding how future commodity prices are expected to evolve.

To summarise, the main factors that contributed to the 2007-08 price spike and will help to determine developments in the future are as follows:

- Demand has grown faster than supply because of, among other reasons, growth in biofuels production.
- Supply would normally have grown more, but unfavourable weather conditions in some important producing countries reduced production and export supplies to world markets. Oil prices are a key factor in determining future agricultural commodity supply responses.
- The sensitivity of demand to price changes appears to be falling for various reasons. Thus, a shock to supply of a given size will require a greater price change to bring about the demand adjustment required to balance the market.

- At the same time, global stocks have declined to record low levels over the past decade, such that any variations in quantities produced and demanded cannot be buffered and hence have a proportionally much greater effect on market prices.
- The sharp increase of financial fund activity in futures commodity markets in 2007-08 may have further contributed to the price hikes, but the extent to which this has been the case is uncertain.
- Border measures taken by many countries in an effort to increase domestic market supplies reduced supplies on world markets, further magnifying the price increases in 2007-08.

These developments combined to lift prices to very high levels in 2007-08. But an element of uncertainty about future developments appears to have had a strong impact as well, as both governments and investors acted in ways that sometimes contributed to the price increases and price volatility. Without these additional influences, prices would most likely not have been as high as they were.

Policy challenges

The *Outlook*'s forecast for lower prices in the foreseeable future, with the possibility of a turnaround being more rapid than is predicted, calls for caution in taking any precipitous policy action. The fact that certain groups in the population and certain countries continue to suffer from high prices provides a policy challenge.

In the short term, humanitarian aid for the populations of countries most severely affected is urgently required. Before the price increases, although there had been improvements, hundreds of millions of people were going hungry because they could not afford food. With higher prices, the number of people suffering from extreme hunger increased even further and the first UN Millennium Development Goal has become an even greater challenge. As suggested recently by the World Bank, aid in the form of cash or vouchers is more appropriate in many cases than commodity shipments, provided supplies can be procured. Such aid may also be more effective than short-term measures such as export taxes or embargoes, which restrain exports in order to ensure the provision of the domestic market from domestic supplies.

In the medium term, there is a real need to foster growth and development in poor countries and to assist them to develop their agricultural supply base. In some of the poorest countries, investment in agriculture, including in agricultural research, extension and education – which has been lagging in recent years – is often the best way to cut poverty and stimulate economic activity. Expected high farm prices may provide an incentive for this.

In other situations, investment in agriculture may be helpful, but there is also a need to diversify the structure of the economy. In general, investments in improving the overall environment in which agriculture operates may be most appropriate. These include improving governance and administrative systems, macroeconomic policy, infrastructure, technology, education and health, and defining and enforcing property rights.

Agricultural trade policies require further reform. Trade-restricting policies – whether they restrict exports or imports – have undesirable and often unintended impacts, especially in the medium and long term. On the import side, "protecting" domestic producers of agricultural commodities by providing high price support and border protection – including the increasing resort to non-tariff barriers – restricts growth opportunities for producers abroad and imposes a burden on domestic consumers. Export taxes and embargoes may in the short term provide some relief to domestic consumers, including to the wealthier ones who may not need these measures, but they impose an even larger burden on domestic producers and limit their supply response, as well as contribute to global commodity market uncertainty.

It is also necessary to examine more closely the causes and impacts of the recent price increases. On the supply side, the links between production and yield shortfalls, climate change and water availability warrant further analysis, in terms of trends, variability and risk. Investments in research and development, technology transfer and extension services, particularly in less developed economies, could do much to increase productivity and output and there may be a role for governments to foster this, especially where there are wider public benefits. In addition, the future development of genetically modified organisms also offers potential that could be further exploited, both to improve productivity and to enhance the attributes of crops destined for either food or non-food uses.

The largely policy-driven nature of the rapid increase in the supply and demand for biofuels is one of the reasons for current and future higher prices. OECD and International Energy Agency analysis to date suggests that the energy security, environmental and economic benefits of biofuels production based on agricultural commodity feed stocks are at best modest, and sometimes even negative, and are unlikely to be delivered by current policies alone. Alternative approaches may be considered that offer potentially greater benefits with less of the unintended market impact, such as policies that encourage reduced energy demand and greenhouse gas emissions, provide for freer trade in biofuels, and accelerate introduction of "second-generation" production technologies that do not rely upon current commodity feed stocks.

Policy interventions, as well as oil price developments, will strongly influence the

evolution of future demand for biofuel from agricultural commodity feed stocks. In this context, neither the US Energy Independence & Security Act nor proposals for a new EU Bioenergy Directive were taken into account in the 2008 *Outlook*. Neither such amendments to legislation nor new technological developments would have a strong impact on projected world prices for agricultural commodities or their availability for food and feed use. Second-generation biofuels are not expected to be produced on a commercial basis over the *Outlook* period.

Finally, over the longer term, agricultural supply is facing increased uncertainties and limitations to the amount of new land that can be taken into cultivation. Public and private investments in innovation and increasing agricultural productivity, particularly in developing countries, would greatly improve supply prospects by helping to broaden the production base and lessen the chance of recurring commodity price spikes.

The 2008 *Outlook* was prepared in an environment characterised by increased instability in financial markets, higher food price inflation, signs of weakening global economic growth and food security concerns. Although projections for agricultural commodity markets have always been subject to a number of uncertainties and the prevailing assumptions, these have taken on more importance in recent years and this is unlikely to change.

Wilfrid Legg is head of the Policies & Environment Division in the OECD Trade & Agriculture Directorate, where he has been since 1981, after working as a research fellow in Sussex University. This contribution has been adapted from the OECD-FAO Agricultural Outlook 2008-17 *and benefits from comments by Pavel Vavra, but neither the OECD nor its member countries are responsible for any remaining errors.*

Chapter 4

The EU food context

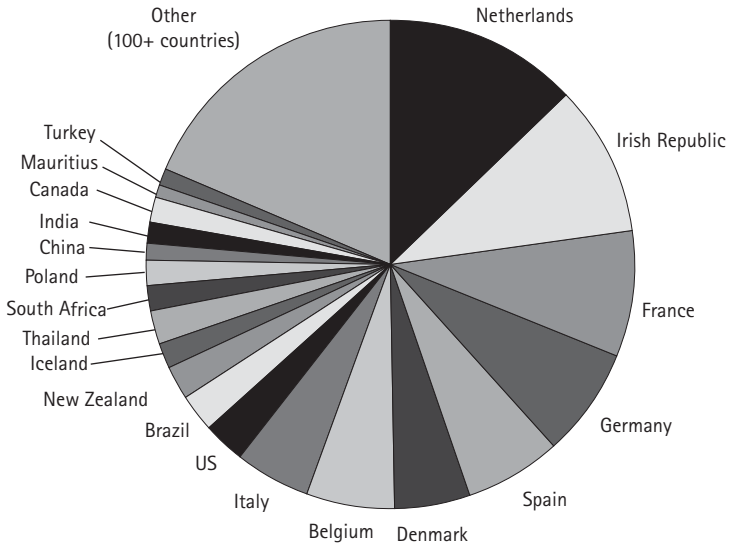
Martin Haworth, Policy Director at the National Farmers' Union

The EU food context

The British government places a heavy emphasis on trade, and on a functioning world trading system, as a vital component of domestic food security.[1] The international flows and movement are a crucial aspect of how we ensure sufficient food within the country.

However, the confidence placed in world trade took something of a knock in 2008, when the reaction to the sudden increases in the price of food was a raft of new export restrictions and other trade-distorting measures all over the world. These ranged from absolute export embargoes in countries such as the Ukraine, Russia and China, to export taxes – most notoriously imposed by the Argentine government, leading to farmer demonstrations and an actual farmer strike. Altogether 42 countries imposed these types of restrictions, with the aim of securing domestic supply and lowering internal food prices, but with the additional consequence of further raising prices on world markets and increasing food security concerns among poor importing countries.

Figure 1: UK food import shares by country and value 2006



Source: Department for Environment, Food & Rural Affairs

1 See: Department for Environment, Food & Rural Affairs *Food Security & the UK: An Evidence & Analysis Paper* (2006); Department for Environment, Food & Rural Affairs *Ensuring the UK's Food Security in a Changing World* (2008)

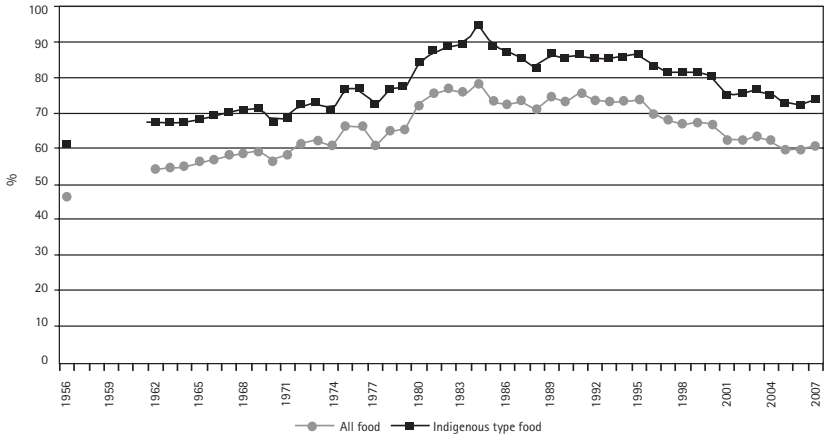
In addition, a number of countries introduced state aids that added to the distortions of the global food market. For example, in 2008 India spent more on subsidising fertiliser than on its entire defence budget. Globally, we seemed to be entering a period of acute instability and insularity.

It is in this context that the UK's membership of the EU is particularly important. A key benefit of membership is the open single market in food and agricultural goods, guaranteed by Articles 28 and 29 of the Treaty of Rome, which prevent quantitative restrictions on imports and exports between member states. And, as the British government is keen to emphasise, the majority of the UK's food imports come from other EU member states.

As figure 1 shows, our most important sources of imports, in descending order, are the Netherlands, Ireland, France, Germany, Spain, Denmark, Belgium and Italy, which together account for more than 68% of all imports.

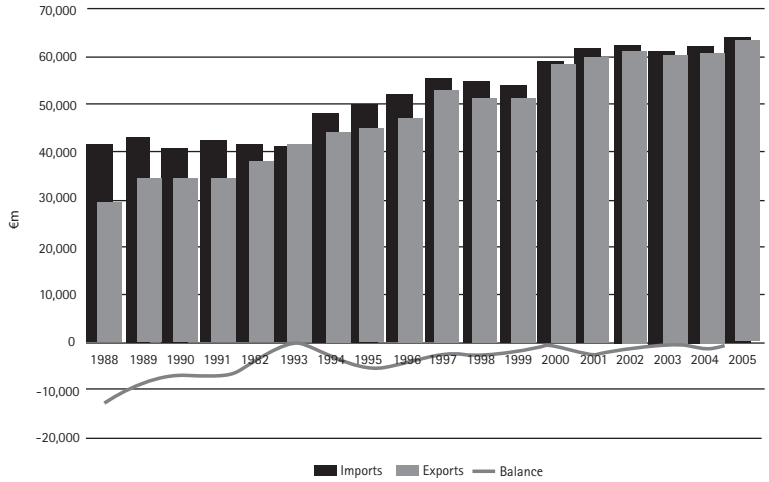
The EU as a whole, although a net importer, is much closer to self-sufficiency than the UK. The situation has been exacerbated in recent years, with the EU moving towards having only a small negative trade balance while the UK has seen its self-sufficiency ratio declining over the past 20 years to a point where it is now at 60% in all food types (74% in indigenous type food). This steady decline is demonstrated in figure 2.

Figure 2: UK self-sufficiency 1956-2007



Source: Department for Environment, Food & Rural Affairs Agriculture in the UK (2007)

Figure 3: EU trade with non-EU in agricultural products 1988-2005



Source: Eurostat

Nonetheless, as one might expect, the overall picture conceals big variations according to different sectors within food and agriculture.

Of particular interest here are tropical foods and oilseeds. The EU is, unsurprisingly, a major importer here. Indeed, and in part due to the tariff- and quota-free access it has established with all the world's least developed countries, the EU is by far the biggest importer from such countries, accounting for more than the US, Canada, Australia and New Zealand combined.

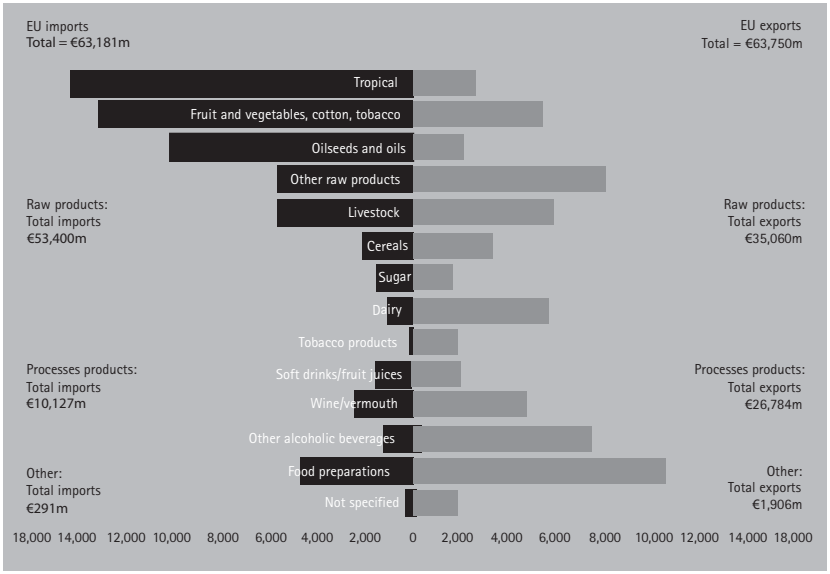
For agronomic and climatic reasons, Europe is not well suited to growing protein crops such as soya beans – which are extensively used in animal feed rations, particularly for pigs and poultry – and is thus highly dependent on imports from the US, Brazil, Argentina and, to a lesser extent, China. This is an area that potentially affects Europe's food security, especially when the attendant issues around genetically modified foods are brought into the equation. It is examined at greater length later in this chapter.

Limited perspective

The debate about food security in Britain tends to be conducted from essentially a national perspective. From a very narrow perspective, the question asked is whether the UK is food-secure. Thus the concerns about our dependency on imports to supplement domestic

production, and the crucial areas in which some of these imports occur, become magnified. The question then becomes what role the world can play in ensuring our security.

Figure 4: EU trade with non-EU in agricultural products 2005



Source: Eurostat

However, food security should really only be considered at the global level. Can the world produce enough food at the present moment? Will it be able to do so in future? What role will different countries and regions play in producing that food? To focus solely on the UK is to miss the point. Clearly the UK, as a relatively rich country with well-established and generally secure trade patterns, could ensure its security by higher levels of imports; and the same would be true of the EU as a whole. But to do so in the current circumstances of global food production and supply would be to exacerbate food insecurity in other parts of the globe, particularly poorer countries. In an interdependent world, this is the real issue. So the real question that needs to be asked is what the potential economic contribution of Europe could be to world food production.

Figures produced by the Food & Agriculture Organization of the UN on the scale of the required increase in global production are generally accepted, but they are also stark. We need to increase food production by 50% in the next 20 years, and double it by 2040.

The amount of new land that can be brought into production is strictly limited, so this increase will essentially have to be found from increased intensity from the same areas as are now used.

At the same time, there are supply-side threats that make this task considerably more difficult – particularly the implications of climate change, which is likely to make large areas of the globe less hospitable for agriculture, and the separate but closely related issue of water availability. Worldwide, some 70% of available fresh water is used for agriculture, and this is becoming scarcer as some important productive areas have relied on depleting aquifers rather than precipitation. (By contrast, the figure in the UK is less than 2%.)

Changes in temperature and declining levels of water are, in fact, likely to have less impact on the temperate climate of Europe, particularly Northern Europe. Indeed in some ways Europe may become better placed in the years to come. In other words, our comparative advantage in agriculture is likely to improve and the gap with the developing world will increase.

This points to the conclusion that Europe ought to be prepared to make at least a proportionate contribution to the world's need to increase production. We should not continue to rely upon imports and expect the new supplies to come from elsewhere. In other words, Europe should possibly look to double its food production in the next 40 years. This task should be made more achievable by the accession of two countries with high but so far largely untapped potential – Bulgaria and Romania – but it remains very challenging.

So what are the policy imperatives at European level?

First, we must not revert to the old-style Common Agricultural Policy of managed markets and protectionism. It is true that these mechanisms did help Europe increase production 50 years ago, but they were only possible in a fragmented world economy, where individual countries or regions could pursue internal agricultural policies without regard to their impact upon the rest of the world. That is no longer possible. Europe will only increase its production if the market signals indicate that it would be economically rational to do so.

Indeed, in one respect, Europe should be seeking to reduce global trade distortions. As mentioned above, no single factor added more to global food insecurity in 2008 than the export restrictions applied by numerous countries. The European Commission, as our trade negotiator, should be seeking to discipline these practices in the World Trade Organization talks; although, to be realistic, this is not likely to be achievable very quickly.

Lack of research

The biggest supply-side constraint on production is the lack of agricultural research and development; this is true not only of Europe but of large parts of the globe, although interestingly not in China. Twenty years ago there was a perception that agricultural markets would be in perpetual surplus, and an ideological drive on both sides of the Atlantic for government to withdraw from what was seen as the proper domain of private industry. Such public research as continued was directed more to environmental outcomes than increasing yields. The error of this approach can be seen today.

Given that there is normally a 20-year time lag between the beginning of a research project and its practical application, it is no surprise to discover that the impact on production is already being felt. In the 1980s the annual trend yield increase for cereals in Europe was about 4%; but by the 1990s this had dropped to 2%. It is now less than 1%. Nor is this the simple result of a natural yield ceiling and the law of diminishing returns: scientists believe the ultimate yield potential for European wheat is at least 19 tonnes per hectare, but in the UK in 2008 (a record yield) it was only 8.2 tonnes.

The urgent need is for more research and development, directed particularly at increasing productivity. There is a very strong case for this being an area where joint European action will produce a "value-added" element. There would also be a case for diverting some of the current Common Agricultural Policy budget – particularly that spent on "rural development" – to scientific research.

Europe's science difficulties do not stop at inadequate research funding, but unfortunately extend to an actual aversion to science in some cases. As was mentioned earlier, Europe is heavily dependent on imports of protein, which is a vital component of many animal feed rations, and therefore a key factor in Europe's food security. Many of the soya crops grown abroad are now genetically modified, and require approval and a licence to be imported into Europe. Unfortunately, the approval process is slow, and in some cases influenced by political, not scientific, judgments.

Furthermore, there is zero tolerance of any trace of any variety that has not been approved; so a boatload with the slightest trace of an unapproved variety is liable to be sent back at the shipper's expense. Recently a number of new varieties of soya beans have been developed that have not been approved. The result is that Europe faces a shortage of potential imports, higher prices and an increasingly uncompetitive livestock industry (pigs and poultry that have been fed on unapproved GM feed can be freely imported into Europe, because the feed is untraceable in the final product). This issue needs an urgent solution.

Importing GM products is one thing; growing them in the EU is another. At present very few GM varieties have been approved for growing in the EU (and none of these is useful or suitable for UK conditions) and no new variety has been approved for a long time. The situation in the rest of the world is rather different (see figure 6).

Figure 5: Global status of GM crops in 2007

Source: Clive James, 2007

Currently most GM varieties have been developed to reduce costs, rather than improve yields, because that was the research imperative when the technology was developed. However, it is surely the case that GM offers not only a wider range of possibilities but also a quicker route to developing new traits than conventional breeding. If the objective is to increase global production, it seems inconceivable that GM technology will not play a central role. And, equally, it is hard to resist the conclusion that if Europe does not revise its attitude, it will get left behind and be unable to play the part it should in achieving global food security.

Chapter 5

Perspectives on UK food security

Andrew Jarvis, Senior Research Fellow at Chatham House and a Principal at GHK Consulting

Perspectives on UK food security

The food price rises of 2007 and 2008 prompted a new wave of interest in UK food security and the UK's role in promoting global food security. Concern about the proximate impact of food price rises has been combined with more insistent calls to focus attention and investment on the long-term challenges facing the food system, including the impact of climate change.

But the debate has often been confused. The problem is generally not well defined. "Food security" itself is a term with multiple definitions, used in a variety of contexts, from the household to the global. This leads to misunderstandings when groups who have different working interpretations of what it means come together.

This chapter focuses on the issues for the UK at a national level, rather than the household or global (though they are of course connected). It suggests how a framework for monitoring and managing UK risks to food security might be built, discusses policy, and looks briefly at the opportunities and threats that the UK faces.

To properly assess the resilience of our food supply we need a view of the system-wide challenges and a diagnosis of vulnerabilities in key supply chains.

For the Food & Agriculture Organization of the United Nations, food security exists "when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life".[1] This definition focuses, appropriately, on the welfare of consumers. It explicitly recognises that the presence of food in a market does not help if people do not have physical or financial access to it.

The fact that availability of food does not in itself provide food security is evident enough in the persistence of severe hunger in a world where there is not an overall shortage of food.[2] Poverty, failures of governance and of distribution are common causes of hunger amidst plenty. And the effects of poverty on nutrition are not limited to the developing world; in a Food Standards Agency survey of low-income households here in the UK, 5% reported having to skip meals for a whole day for want of money.[3]

1 *Rome Declaration on World Food Security and World Food Summit Plan of Action*, issued at the World Food Summit on 13-17 November 1996 (Food & Agriculture Organization, 1996)
2 As famously documented in: Sen, A *Poverty & Famines: An Essay on Entitlement & Deprivation* (Oxford University Press, 1981)
3 Food Standards Agency *Low Income & Diet Survey* (2007)

As described later on, the UK's food consumers enjoy a position of considerable comfort by world standards. But standard indicators on availability, accessibility and affordability, while helpful, give insufficient information about the food system's resilience in the face of future risks. Even if the shelves are full today, can we really claim to be food-secure if the system is inherently fragile, and if its capacity to supply tomorrow is less than it was today because stocks of natural, human, social or economic capital have been eroded?

So a forward-looking, comprehensive assessment of UK food security needs to examine the wider system, its resilience to shocks and stresses, and its long-term sustainability. It requires the identification, measurement and evaluation of the contingent and systemic risks to availability, accessibility and affordability of safe food within key supply chains and for the system as a whole, looking from the present to the long term. It has to examine inputs and drivers of change to identify how exposure to risk could be influenced by, for instance, changes in diet, water scarcity, climate change mitigation policies and changes in sourcing that might affect food safety.

On this foundation indicators can be identified, and risk mitigation and management strategies developed. Without the system approach it is not possible to determine how and where interventions, including public policy, are best applied.

Finding the right level at which to conduct such analyses is a common challenge. In particular, there are real limitations to how far one can get in a debate about the undifferentiated concept of "food", when in practice people consume a mix of different foodstuffs – vegetables, meat, fish, cereals, fruit and other products. So while a system perspective is essential, it is also necessary to work at the individual supply chain level to identify, monitor and manage specific risks. This may reveal important linkages to core food policy objectives – such as the health goal of promoting higher consumption of fruit and vegetables, or the focus on reducing E. coli and Campylobacter contamination of meat supply chains.

The roots of the present confusion and circular debates lie in these complexities and in the different working definitions of shared terms.[4] But short cuts through the problem generally reveal themselves to be dead ends. Among the most popular, but also least helpful of these is the use of self-sufficiency as a catch-all indicator of the state of national food security.

4 For a discussion of the various definitions of food security, see: Department for Environment, Food & Rural Affairs F*ood Security & the UK: An Evidence & Analysis Paper* (2006)

The aggregate measure of UK food self-sufficiency is calculated as the value of UK production of raw food (including exports) divided by the value of raw food for domestic UK consumption. It is thus a mixed derivative of consumer dietary preferences (tuna rather than herring, imported grapes rather than British apples, salads rather than root vegetables in winter, and so on) and the competitiveness of UK farming and food businesses in domestic and overseas markets. Its weaknesses as a measure of food security include:

- The match between patterns of production and patterns of domestic demand is not considered (an increase in export production of a food that no one in the country eats "improves" nominal self-sufficiency).
- It says nothing about changes in families' access to the foods they wish to buy at prices they can afford.
- It gives no hint of the weaknesses and vulnerabilities in the production system (such as a very narrow genetic base in a crop, a lack of competition in the market or dependence on a single supplier).
- It focuses on final production and ignores balance of trade and vulnerabilities in critical inputs like energy, fertiliser, feed or machinery; this is akin to measuring security of electricity supply by reference to number of domestic power stations without consideration of whether the country has access to the fuel needed to run them.
- It implies a causal link between increased domestic production and higher food security that ignores (a) the role of diversification in reducing risk and (b) the fact that food chain risk factors (such as drought and animal disease) rarely map neatly to national borders. Access to overseas markets helps keep food on local shelves when domestic supplies are interrupted.

Across the main commodity groupings, the UK's calculated self-sufficiency ranges from approximately 10% in fruit to around 100% in cereals (though there is also trade in cereals, balancing out demand and supply of grains of different type and quality). Self-sufficiency ratios have changed over time depending on the influence of policy, productivity and national circumstance. Current levels are unremarkable in a modern historical context.

Self-sufficiency has declined somewhat since the 1980s/1990s, but this reflects the fact that that period was the high-water mark of Common Agricultural Policy production incentives, with all the economic and environmental costs that those entailed. Some of the decline of the past 15 years is also attributable to domestic system failures – the UK's overall food self-sufficiency dropped by more than five percentage points between 1995 and 1997 in the wake of the BSE outbreak and the associated limits on UK meat and animal exports.[5]

5 Cabinet Office *Food Matters: Towards a Strategy for the 21st Century* (2008)

Table 1: Indicative British self-sufficiency ratios over different periods

Pre-1750	Around 100% (in temperate produce)
1750-1830s	Around 90-100% except for poor harvests
1870s	Around 60%
1914	Around 40%
1930s	30-40%
1950s	40-50%
1980s	60-70%
2000s	60%

Note: for all food unless stated.
Source: Department for Environment, Food & Rural Affairs *Food Security & the UK: An Evidence & Analysis Paper* (December 2006)

The basic principles of UK policy on food security are well embedded, but work now in progress could result in innovations in monitoring and management systems.

Food security has had a low profile in UK public policy for most of the past decade. Food's share of household expenditure fell steadily; much of EU farm policy was preoccupied with managing the consequence of excess production capacity rather than scarcity, and the supply chain meanwhile provided consumers with access to ever more food options. The increasing popular interest in food and food issues focused on production values, provenance, environment and health. Affordability and security of supply were side issues.

But global food commodity prices in 2007 and 2008, together with an accumulated weight of evidence of the long-term challenges to the food system (not least climate change), changed the international political landscape for food security and raised questions about the UK's capacity to manage changing circumstances in food markets.

Back in 2006 Margaret Beckett, the then secretary of state for environment, food and rural affairs, set out the case for freer trade in food as a route to food security and wider global security:

We do not take the view that food security is synonymous with self-sufficiency ... It is freer trade in agriculture which is key to ensuring security of supply in an integrating world. It allows producers to respond to global supply and demand signals, and enables countries to source food from the global market in the event of climatic disaster or animal disease in a particular part of the world. ... It is trade liberalisation which will bring the prosperity and economic interdependency that underpins genuine long-term

global security.[6]

In December 2006 the Department for Environment, Food & Rural Affairs published a carefully constructed analytical paper on food security.[7] It provided an analysis of recent trends and their historical context, and explained why the lexicon of food security and the complexity of the problem tend to propagate confusion.

But, despite that evidence, the revival of the food security debate in 2008 has seen some familiar arguments revisited. The government's case for trade liberalisation as set out in Beckett's speech has come in for renewed criticism. It has been accused of having excessive faith in global markets and underplaying the importance of domestic supply. And there have been suggestions that the pendulum had been allowed to swing too far in the direction of environmental protection, thereby constraining farmers' ability to raise output and contribute to higher global supply.

During the course of last year, a series of government reports and papers on food and food security emerged. In June the government published a paper on trends in global commodities, concentrating in particular on energy and food commodities.[8] Having examined the factors behind the large commodity price rises of 2007/08, it outlined a framework for international action. This involved: maintaining economic stability; promoting openness; encouraging co-operation; supporting innovation and investment; ensuring fairness; and mitigating the effects of climate change.

In July the Cabinet Office published *Food Matters*,[9] the final report of a cross-government project commissioned by the prime minister before the food price rises took hold. This considered UK food policy in the round and set out the case for a stronger and better-integrated policy framework to promote coherent management of a complex policy agenda. In its examination of UK food security it rejected self-sufficiency as a policy goal in favour of a focus on resilience, while emphasising that this was consistent with a positive agenda for a competitive UK food industry:

Improving competitiveness in food production, raising sustainable output and building a successful food chain economy are important objectives in their own right. They may result in "positive" movements in self-sufficiency measures but do not need to be justified in those terms.

6 Margaret Beckett "Action in Response to Opportunity and Challenge", speech given to the Agra-Europe Outlook Conference in London on 23 March 2006
7 Department for Environment, Food & Rural Affairs, op cit
8 HM Treasury *Global Commodities: A Long-term Vision for Stable, Secure & Sustainable Global Markets* (2008)
9 Cabinet Office, op cit

Food Matters concluded that the principal food security challenge for the UK was a global one – a world in which food is scarce and less affordable is less stable. It focused in particular on the need to raise agricultural productivity in the developing world and on the challenge of climate change, concluding:

The scale of the challenge of raising output to feed a larger, wealthier human population, adapting to climate change and mitigating food-related emissions, all at once, is not to be understated.

Close on the heels of *Food Matters,* Hilary Benn, secretary of state for environment, food and rural affairs, called for a new debate on the long-term challenges to UK food security, such as climate change, increased demand and the energy dependence of our food supply, and an assessment of the impact of shorter-term issues such as export bans and commodity price rises.

DEFRA released a consultation paper, *Ensuring UK Food Security in a Changing World*,[10] which aimed to describe the trends that had led to the global situation, set out the challenges facing the food chain, and examine whether the UK food supply chain was sufficiently resilient to withstand short-term shocks and robust in the face of the long-term challenges. This paper was followed in the autumn of 2008 by stakeholder workshops to explore issues and discuss indicators.

Reporting on progress in a written ministerial statement in December 2008,[11] Benn rejected the pursuit of self-sufficiency as a policy goal, noting:

Food security is most usefully looked at in terms of the resilience of our food supply chains, access to safe, nutritious, affordable and diverse foods, and ensuring the long-term environmental sustainability of the food and farming sector.

He announced that the newly formed Council of Food Policy Advisers would be asked to advise on what may be necessary in future to ensure a secure and sustainable food system in the UK, and to examine DEFRA's draft indicators for food security in the light of responses.

So the food security initiative continues. It is not yet clear whether this will conclude

10 Department for Environment, Food & Rural Affairs *Ensuring UK Food Security in a Changing World*, discussion paper (2008)
11 Written ministerial statement by Hilary Benn, "Food Security", 10 December 2008. Available at: http://www.defra.gov.uk/corporate/ministers/statements/hb081210a.htm, accessed 4 February 2009

that it is sufficient to track a set of "off-the-shelf" indicators or will seek to establish a more comprehensive risk management framework.

The relative comfort of the UK's current position is not a reason to ignore the fundamental challenges to the present operation of the food system that await in the decades ahead.

There is now no shortage of analysis and advice for DEFRA and others to draw on in their deliberations. Chatham House has made its contribution through two recent reports. *The Feeding of the Nine Billion*[12] examines the international situation and defines a clear agenda for improving long-term global food security. *Food Futures: Rethinking UK Strategy*[13] draws together the threads of a long-term project that worked with stakeholders from the UK dairy and wheat supply chains to explore what the future might hold for UK food supply and the implications for the food chain and for government.

The 2007/2008 commodity price changes were another reminder of the interconnected nature of the global economy. They illustrated the potential for natural events (such as drought), public policy (such as policies for biofuels) and factors elsewhere in the economy (such as high oil prices) to negatively affect food security around the world.

The UK is not immune from shocks to the global food system. Price surges, whether for farm inputs or food commodities, ripple through global markets and impact on UK producers and consumers. There is significant uncertainty about the future direction of markets for inputs such as energy and fertiliser, and in food commodities.

But, in facing these circumstances, the UK enjoys a position of relative strength:

- It is one of the world's wealthiest countries. Incomes have risen faster than food prices; food has become steadily more affordable. The average share of household expenditure allocated to food was 10.3% in 2006, compared with around 20% in 1970.[14] The comparable figure in developing countries can be 60% or more.

- There is good access to food. Consumers are linked to food producers by a sophisticated and competitive agri-food chain. This has proven adept at managing discontinuities in supply and providing choice for the consumer, including year-round availability of

12 Downloadable from the Chatham House website: http://www.chathamhouse.org.uk/publications/papers/view/-/id/694/
13 Downloadable from the Chatham House website: http://www.chathamhouse.org.uk/publications/papers/view/-/id/695/
14 Department for Environment, Food & Rural Affairs *Food Statistics Pocketbook 2008*. There is variation around the mean, with poorer households allocating a higher share of expenditure to food – around 15% for the poorest decile.

seasonal produce. The supply chain depends heavily on UK farming and food manufacturing, but also sources from around Europe and around the world.

- Availability of food is also good. A little under 50% of food consumed in the UK is grown here and around 70% of food imports come from the EU and the European Economic Area. Key suppliers such as Ireland, France, Norway and Spain are regarded as reliable. External non-EU supplies are generally well-diversified.

- Food has become safer. Though there is no cause for complacency, food-borne diseases have declined over time.

- Projections suggest that the UK is likely to be less affected by the early phases of climate change than many other countries. Whilst impacts such as increased water scarcity, extreme weather events and flooding are expected, models suggest these will be less extreme than in, say, the Mediterranean basin.

- The UK has a significant scientific and technological capability, which can be deployed to monitor and mitigate risks, and it also is well placed to positively influence the international policy debates.

But the system has vulnerabilities, the future is uncertain and there are some very substantial long-term challenges to be addressed:

- The potential for global events to have domestic impacts means that, even within the sheltering walls of the EU, dysfunction in the global food system can erode UK food security. Many analysts are predicting that food commodity prices will not return to the lows of the early 2000s.

- Contingent risks to food supply remain, examples being accidental or deliberate food contamination and disruption to logistics infrastructure. Lean distribution systems and shifts in consumption patterns (such as towards chilled foods) may make consumers more vulnerable to interruptions in supply of food and energy.

- As elsewhere in the EU, much of the UK farming sector is still heavily dependent on public subsidy and there are sectors (such as beef and sheep farming) where even on present terms many producers struggle to make a profit. There is further to go in strengthening supply chains, connecting farmers to consumers, raising productivity and finding sustainable business models.

- food chain is a large consumer of fossil fuels. The UK is set to become more dependent on imported energy. The medium-term outlook for energy prices is highly uncertain.

- Climate change is expected to affect farming, with increased water scarcity and more extreme weather events, and possible shifts in the distribution of diseases. The Mediterranean basin, which is an important source of fruit and vegetables, is expected to be affected more severely than the UK.

- The food chain is a significant source of greenhouse gas emissions. Policies to drive the transition to a low-carbon economy will have a significant impact. Application of the Stern framework to the food chain – carbon pricing, new technologies and removing barriers – is still in its early stages.

- Looking beyond direct greenhouse gas emissions, the environmental impacts of food production, here and abroad, are often not sustainable. Issues include loss of biodiversity, loss of soil productivity, increasing water scarcity in some regions, water pollution, solid waste, over-fishing and the external costs of pollution from food distribution. The meat and dairy supply chains face particular challenges.

- Reform of agricultural trade, a major barrier to conclusion of the Doha round of international trade talks, has not been made any easier by the events of the past two years. Confidence in the security of supply provided by the global trading framework has been shaken. Some countries have responded by seeking bilateral solutions that circumvent the global market, including barter trade and land lease deals.

- Substantial increases in overall global food supply are required in the decades ahead to meet the demand of a growing, wealthier population.

Comparison of the Chatham House reports shows a number of themes common to the UK and global agendas. These include:

- expectations of continued volatility in food markets and the need for tools to manage and mitigate these effects;
- a substantial innovation challenge across the food chain, and particularly in farming, that is likely to require increased investment;
- the need for measures that rebuild confidence in global food markets and address the threat of protectionist actions; and
- the need for new partnership arrangements and for governments to take a lead.

Though food commodity prices have receded from their 2008 peaks, they remain well above the level of the preceding years. The question for 2009 is whether, having received the wake-up call, the world community will now act to improve long-term food security or, distracted by a broader set of economic problems, allow the opportunity for concerted action to be missed.

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Designed and produced by Owen & Owen