



General Certificate of Education  
Advanced Level Examination  
June 2014

## General Studies (Specification A)

## GENA4/PM

Unit 4 A2 Science and Society

### Case Study Source Material

To be opened and issued to candidates on or after 1 April 2014

For use with **Section A**

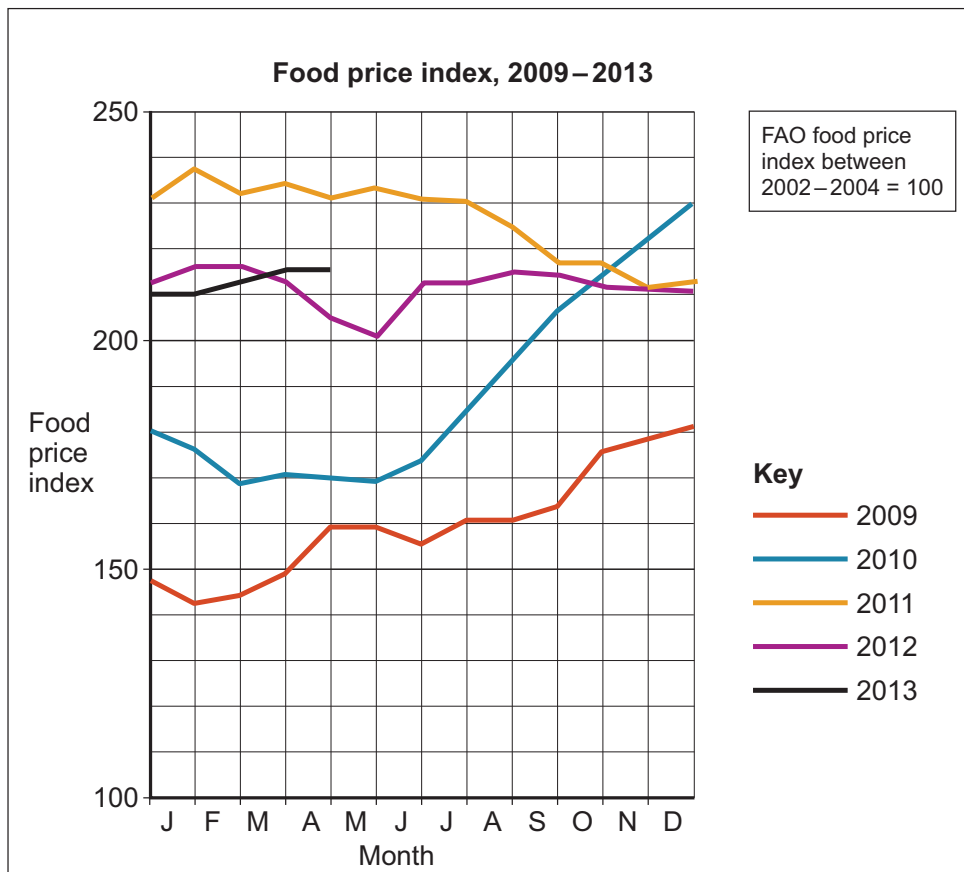
- The material consists of five sources (A, B, C, D and E) on the subject of **agriculture and food production**. These extracts are being given to you in advance of the Unit 4 examination to enable you to study the content and approach of each extract, and to consider issues which they raise, in preparation for the questions based on this material in Section A.
- A further Section A source (F) will be provided in the examination paper.
- Your teachers **are** permitted to discuss the material with you before the examination.
- You may write notes in this copy of the Source Material, but you will **not** be allowed to bring this copy, or any other notes you may have made, into the examination room. You will be provided with a clean copy of the Source Material at the start of the Unit 4 examination.
- You are not required to carry out any further study of the material than is necessary for you to gain an understanding of the detail that it contains and to consider the issues that are raised. It is suggested that three hours' detailed study is required for this purpose.
- In the examination room you are advised to spend approximately one hour and fifteen minutes reading a previously unseen extract and answering a range of Section A questions based on all the source material.

Source A (Figures 1–7)

## Recent trends in world food commodity prices: rising cost of food

Figure 1

The Food and Agriculture Organisation (FAO) of the United Nations Food Price Index



Source: data from [www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/](http://www.fao.org/worldfoodsituation/wfs-home/foodpricesindex/en/)

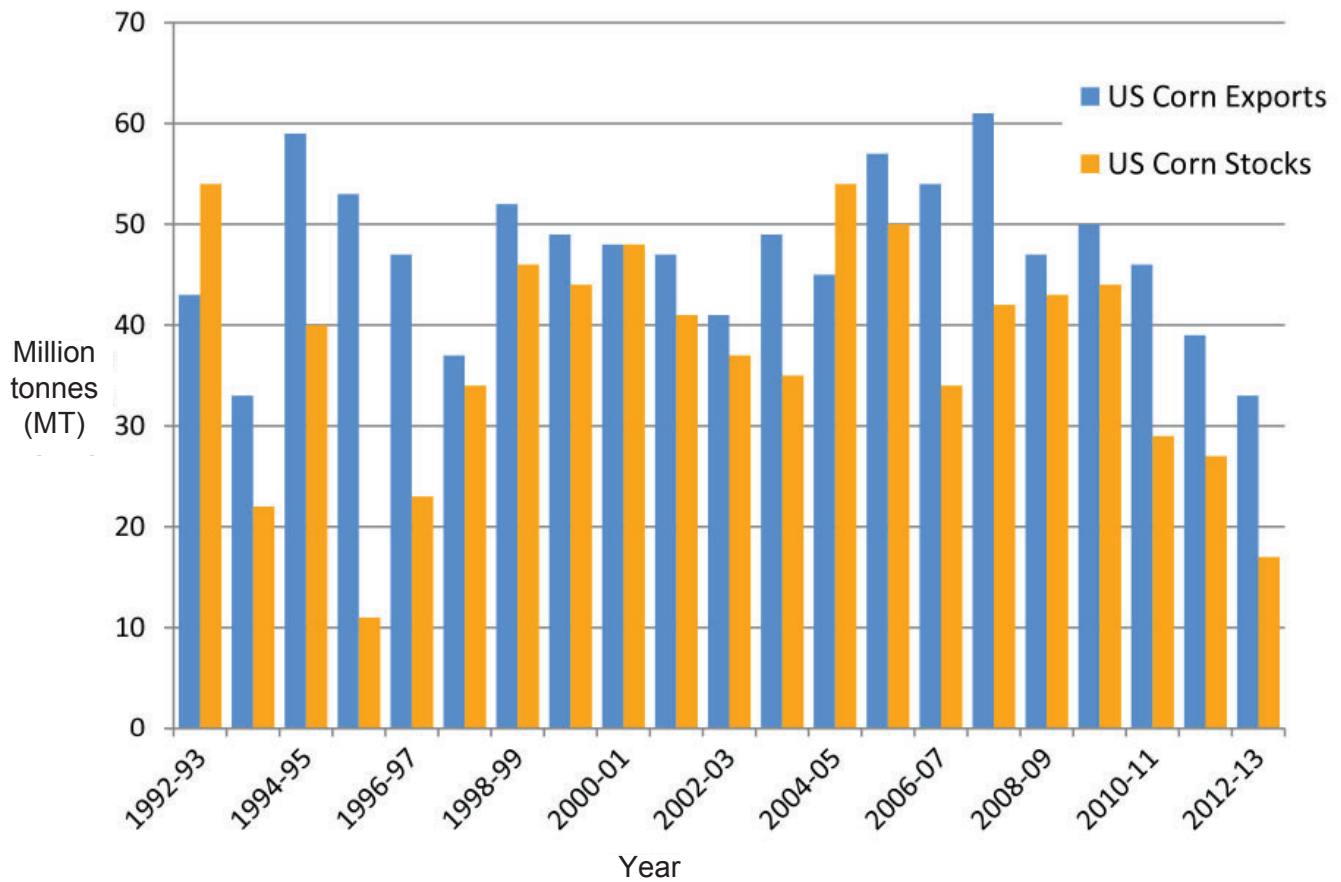
### Key points

- Prices of food commodities on world markets, adjusted for inflation, declined substantially from the early 1960s, increased slowly from 2003–2006, then surged upwards from 2006–2008.
- Demand from consumers in rapidly growing economies in the world is expected to increase.
- World population will continue to grow.
- Further growth in biofuels will place additional demands on the food system.
- On the supply side, there are challenges owing to scarce natural resources in some regions as well as declining rates of yield growth for some commodities.
- Food price volatility may increase because of stronger linkages between agriculture and energy markets, as well as an increased frequency of weather shocks.

Source: adapted from *The State of Food Insecurity in the World, 2011*  
[www.fao.org/docrep/014/i2330e/i2330e00.htm](http://www.fao.org/docrep/014/i2330e/i2330e00.htm)

Figure 2

## US Corn exports slashed; lowest stocks since 1995–1996



- Extreme heat and dryness in much of the US corn belt continued to decimate the US corn crop during July 2012.
- The reduction in US corn production is estimated to result in the lowest stocks, 16.5 million tonnes (MT), since 1995–96.
- The supply situation in the US will constrain exports, which are estimated at 33.5 MT, the lowest in 19 years.
- Major global importers will struggle to fulfil their demand for corn in feed rations and are expected to turn to other suppliers and to diversify their feedstuffs.
- South American producers are expected to respond to record prices by planting more corn in coming months.

Source: adapted from 'Grain: World Markets and Trade', Circular Series FG 08-12, August 2012  
 Foreign Agricultural Service (FAS), US Department of Agriculture  
[www.fas.usda.gov/psdonline/circulars/grain.pdf](http://www.fas.usda.gov/psdonline/circulars/grain.pdf)

**Figure 3**

**The world is watching and waiting while US farmers struggle with the worst drought in 25 years**



Corn plants struggle to survive in a drought-stricken farm field in July 2012, Nebraska, USA.

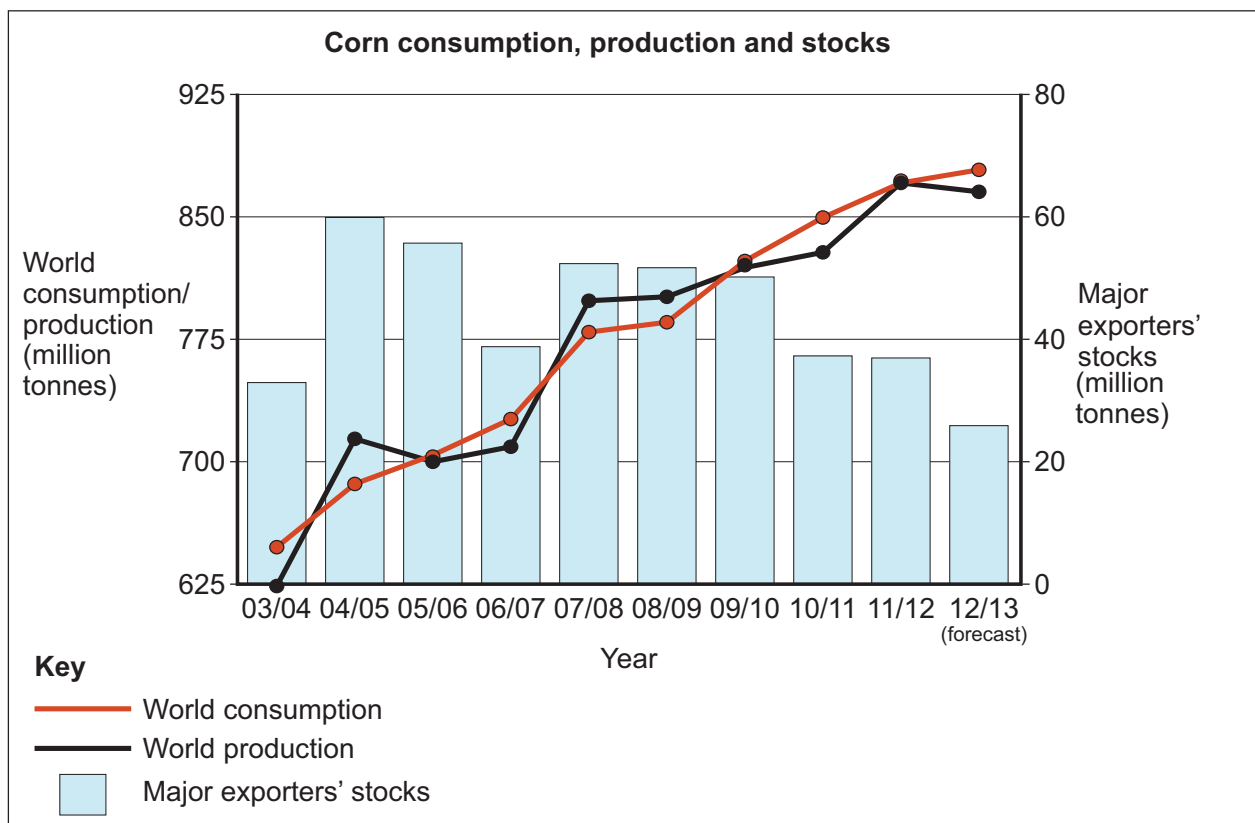
- What looks to be the worst drought in 25 years has seen key grain prices hitting highs which caused food crises in vulnerable parts of the globe last time around.
- With so much of the world putting faith in a record US corn crop, it is little wonder that prices have surged around 40% in the past three weeks as relentless dry weather melted yield expectations for cereals. Soya bean prices are at record highs, while wheat is not far behind.
- Now, corn futures contracts backed by the 2012 harvest are above \$7 a bushel and climbing fast.
- There are several parallels between the current state of play and other recent food crises, including scorching weather, wilting crops and sky-rocketing prices. Just substitute 2012's US drought and corn crop failure for a similar crop failure in Russia in 2010.
- Similarities can also be found with 2008, when prices were last at these levels, culminating in the failure of Lehman Brothers. Now Europe's debt crisis has left the euro zone precariously balanced.
- The uncertainty has led to swings in all markets, this time as then, but the simple common denominator of supply and demand has been the driving force of the latest grain price spike, with weather the only fundamental that matters.

Source: based on US news articles, July 2012  
Image: © Thinkstock

Figure 4

### Food crises doomed to repeat until leaders find courage to fix problems

- Oxfam teams around the world say that developing countries are bracing themselves for the worst effects of rising corn, soya and wheat prices on their poorest people.
- The world is already witnessing a record number of food-related emergencies. The UN estimates that some \$7.83bn is needed to respond to food-related crises in Afghanistan, Yemen and many parts of Africa.
- Other fragile populations around the world, living on or near the poverty line, will be dragged under by price spikes and volatility. Nearly a billion people are already too poor to feed themselves.
- There are important differences and similarities between 2012 and 2008. In 2008, oil prices were 30% higher than 2012 and the global price of rice spiked (not the case in 2012). There was also, in 2008, damaging commodity speculation (which could happen in 2012). In both years, US and EU biofuels mandates played a major part in artificially inflating prices. In 2012, the crisis has been sparked by droughts in the US (the world's largest exporter of soya, wheat and corn).



Source: 'Food crises doomed to repeat until leaders find courage to fix problems', August 2012  
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[www.oxfam.org.nz/reports/2012](http://www.oxfam.org.nz/reports/2012)

Figure 5

**World Fuel Ethanol Production 2008, 2010 and 2012 in US gallons**  
 (1 US gallon = 3.8 litres)

**2008**

Country/Area (top producers)	Millions of Gallons
USA	9 000
Brazil	6 472
European Union	734
China	502
Canada	238
Other	389
<b>World Total</b>	<b>17 335</b>

**2010**

Continent	Millions of Gallons
North & Central America	13 721
South America	7 122
Europe	1 209
Asia	786
Australia	66
Africa	44
<b>Total</b>	<b>22 948</b>

**2012**

Continent	Millions of Gallons
North & Central America	13 768
South America	5 800
Europe	1 139
Asia	952
Australia	71
Africa	42
<b>Total</b>	<b>21 772</b>

Source: based on data from 'World Fuel Ethanol Production'  
 Renewable Fuels Association (RFA) & F.O. Licht's, 2013  
<http://ethanolrfa.org/pages/World-Fuel-Ethanol-Production>

Figure 6

### Must the poor go hungry just so the rich can drive?



Mo Farah (back right), lines up with Pele (foreground), Haile Gebrselassie (front right), Brazilian vice-president Michel Temer (back left) and David Cameron for the 'hunger summit' photocall.

- Biofuels are the means by which the governments in the rich world avoid hard choices. They have chosen to exchange our wild overconsumption of petroleum for the wild overconsumption of fuel made from crops.
- The US and the European Union have both set targets and created generous financial incentives for the use of biofuels.
- Already 40% of US corn (maize) production is to feed cars. The proportion will rise this year as a result of the smaller harvest.
- Though the market for biodiesel is largely confined to the EU, it has already captured 7% of the world's output of vegetable oil. The European Commission admits that its target will raise world cereal prices by between 3% and 6%. Oxfam estimates that with every 1% increase in the price of food, another 16 million people go hungry.
- By 2021, the Organisation for Economic Co-operation and Development (OECD) says that 14% of the world's maize and other coarse grains, 16% of its vegetable oil and 34% of its sugar cane will be used to make people in the gas-guzzling nations feel better about themselves.
- The rich world's demand for biofuels is already causing a global land grab in developing countries for industrial biofuel production.
- When the impacts of land clearance and the use of nitrogen fertilisers are taken into account, biofuels produce more greenhouse gases than fossil fuels do.

Source: adapted from 'Must the poor go hungry just so the rich can drive?'  
George Monbiot, The Guardian, 13 August 2012

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[www.theguardian.com/commentisfree/2012/aug/13/poor-hungry-rich-drive-mo-farah-biofuels](http://www.theguardian.com/commentisfree/2012/aug/13/poor-hungry-rich-drive-mo-farah-biofuels)  
Image: Steve Back/Rex Features

## Figure 7

### A distant perspective

An all-seeing Martian visiting Earth to study how we feed ourselves would be baffled and amazed. He would see:

- an industry worth £3 trillion a year using photosynthesis and animal husbandry to feed five billion mouths adequately at least twice a day;
- *Masterchef* contestants turning crème de menthe and sodium alginate into mint caviar for three of the most pampered palates on the planet;
- about a billion people going hungry.

It should be added that:

- Whatever you think of genetic modification, the slower science of selective breeding has wrought quiet miracles in crop yields across Asia and the Americas in the last 40 years. It is now, at last, creeping into sub-Saharan Africa with as much potential to alleviate hunger as an extra rainy season.
- Mint caviar and drought-tolerant maize both reflect a similar curiosity about food at the level of individual cells and molecules.
- The Martian would be astounded at the 100 million tonnes of food we waste each year.
- He would march on Brussels to demand an end to the EU stalemate on GM regulation and changes to a fisheries policy that causes thousands of tonnes of fish a year to be thrown back into the sea, dead.
- The Martian ought to head home optimistic that, with the pace of global population growth slackening and our understanding of what makes food sustain us deepening, we may yet make hunger history.

Source: adapted from Editorial 'We can lick this 40-year food crisis'  
Eureka Magazine, Issue 31, © The Times, April 2012



**Source B****Britain will starve without Genetically Modified (GM) crops, says major report**

A new row over genetically modified foods being introduced into our shops has broken out after a Royal Society report\* recommended that GM crops should be grown in Britain. The study, the work of eight eminent scientists and chaired by Professor David Baulcombe, Professor of Botany at Cambridge University, concluded that GM crops are needed to prevent a catastrophic food crisis by 2050.



Oilseed rape, one of the four main commercial genetically modified crops

But the report has sparked a backlash from opponents of GM foods who say they present a threat to the livelihood of small farmers. They fear that the government will use the 100-page study to force the introduction of GM technology back on to the political agenda. Many in the Cabinet and Whitehall appear to be convinced that Britain can no longer resist its introduction into the UK market.

Previous plans to grow GM crops commercially in the UK had to be scrapped following a concerted campaign by environmental protestors and a backlash by consumers who refuse to eat so-called 'Frankenstein foods'. However, the Royal Society report is expected to say that Britain should no longer resist their introduction.

A source told *The Sunday Telegraph*: "The report will say the right GM crops should be used in the future to alleviate food shortages. This study is going to move the debate forward. The world is undergoing dramatic change and it won't be long before people are thinking 'where is my next meal coming from?' Where GM has been proved effective at either increasing yields, or else resistant to diseases, it should be used in the UK. GM crops are not the only solution to world hunger but they are part of it."

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\* Reaping the Benefits: Towards a Sustainable Intensification of Global Agriculture

The report looks at a series of options to increase crop yields in the UK and around the world and, although GM is only one option, it is likely to be the most controversial. The fear of the effect of GM crops on surrounding harvests led to eco-activists destroying field test sites, which was a major factor in forcing producers to withdraw proposals to grow GM in the UK.

Only one GM crop, a type of maize engineered by the American agricultural biotech firm Monsanto, has even been approved for planting in the European Union, currently in Spain. But outside the EU, GM crops are grown on as much as 125 million hectares of land, mainly in North and South America and the Indian subcontinent. However, over 60% of the 2.6m tonnes of soya imported into the UK last year was genetically modified and GM soya oil is widely used in the catering industry.

Environmental campaigners are suspicious that the Royal Society report is part of a renewed attempt to force GM crops on to the British public. They fear that the Society's terms of reference were flawed and accused scientists of using the public's fears over climate change to try to influence the debate on GM.

Kirtana Chandrasekaran, Friends of the Earth's food campaigner, said: "There is no scientific evidence that GM produces huge yields. The public doesn't want it, small scale farmers don't want it and yet the government keeps on pushing it. It's completely outrageous."

Source: adapted from 'Britain will starve without GM crops, says major report'

Robert Mendick & Patrick Sawyer, The Telegraph, 18 October 2009

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[www.telegraph.co.uk/science/science-news/6359130/Britain-will-starve-without-GM-crops-says-major-report.html](http://www.telegraph.co.uk/science/science-news/6359130/Britain-will-starve-without-GM-crops-says-major-report.html)

Image: © Thinkstock

## Source C

### Tories and Labour renew backing for GM food crops

Controversial genetically modified food crops could help to increase food production massively to meet growing populations and consumption, politicians from both major parties said at the annual Oxford Farming Conference.

Agriculture minister Jim Paice said that the promised benefits of GM varieties – which would need less nitrogen fertiliser, pesticides or fresh water than non-GM foods – could not be ignored as demand was rising and pressure on resources and land increasing.

“GM is not the answer to everything, but in the foreseeable future we’ll have nitrogen-fixing wheat,” said Paice. “It’s going to be a big challenge for the industry and consumers as to whether they are prepared to welcome that for the major environmental gains against the concerns that people have against GM.”

With ‘sustainable intensification’ of farming a top conference theme, Paice said the UK wanted the European Union to agree to lift restrictions on trials and sale of GM products, so countries like the UK could “do its own thing” so “we can use this technology where appropriate”.

But he said supermarkets needed to take the lead on introducing GM food for sale more widely. “Whatever the government says about GM the public will never believe it – but perversely they believe very strongly that what goes on a supermarket shelf is good and safe to eat,” he said.

Mary Creagh, Labour’s shadow environment secretary, used her speech to call for scientists to explain the benefits of GM better, and told *The Guardian*: “We have to keep an open mind on this. I don’t think we should ignore the role science should play in tackling environmental challenges.”

Farming leaders have long called for more trials of GM crops in the UK but many trials have been abandoned after direct action by protestors. However, critics say it is not possible to be sure that GM crops will not spread into the wider environment from trial sites and warn that GM supporters have repeatedly over-promised on the benefits of the technology and underplayed the risks. The devolved administrations in Wales and Scotland have separately banned GM trials.

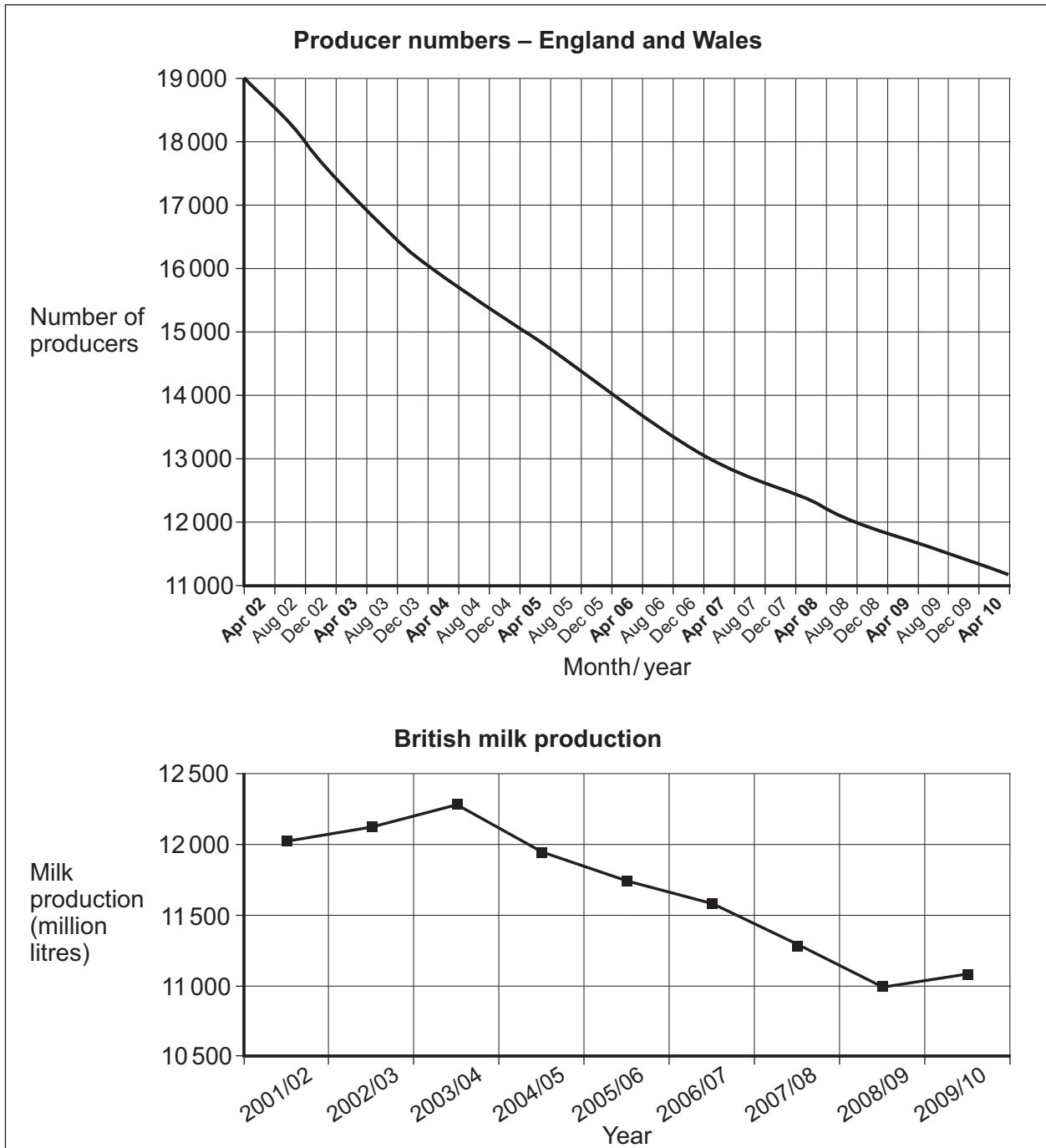
“US farmers are battling superweeds and superpests as GM technology is proving unsustainable and more weeds and pests become resistant due to growing GM crops,” said Helen Wallace, director of GeneWatch UK. “Valuable GM-free markets have been lost to them and conventional and organic farmers have paid a heavy price. Britain will benefit if it maintains and enhances its diverse farming system and keeps its markets GM-free.”

Source: adapted from ‘Tories and Labour renew backing for GM food crops’  
Juliette Jowett, *The Guardian*, 5 January 2012

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[www.guardian.co.uk/environment/2012/jan/05/gm-food-crops-demand-prices](http://www.guardian.co.uk/environment/2012/jan/05/gm-food-crops-demand-prices)

## Source D

## Dairy farmers step up protest over price paid for milk



More than a thousand dairy farmers are blockading milk plants this weekend as the dispute intensifies over cuts in the price they are paid for milk. Following protests at a number of dairy complexes, during which farmers held demonstrations at sites run by Arla, the owner of Cravendale, Lurpak and Anchor brands, union representatives said they had no choice but to continue their action.

“A lot of farmers are desperate,” said Andrew Hemming, of Farmers For Action and a lifelong dairy farmer from Solihull. “We don’t want to go down this route but we need to make our voices heard. Farmers are angry. We are angry at the way we’ve been treated ... but we have got an amazing amount of unity.”

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At the heart of the dispute are the contracts between dairy farmers and milk processors. Processors such as Arla, Robert Wiseman and Dairy Crest, set the price they pay farmers for their milk. Most farmers are tied into a 12-month contract and have no say in the price-setting process.

The farm gate price was cut by 2p per litre in June. Now more cuts are due from the beginning of August. The major firms say they have no choice because the price they can sell cream for on the commodities market has fallen very sharply in the last 12–18 months, but farmers claim this is a shabby excuse.

According to Robert Newbery, the chief dairy adviser for the National Farmers' Union: "Farmers are being affected very seriously. Their cost of production is around 30p per litre but after 1 August the price won't even cover their costs of production." Newbery said that processors had been selling liquid milk to supermarkets at vastly reduced prices to secure lucrative contracts.

While the government says it cannot intervene in the setting of milk prices, the Department for Environment, Food and Rural Affairs has convened a number of meetings with farmers' unions, processors and retailers next week. It hopes all parties will come together and agree a voluntary code for the industry.

Jim Paice, the farming minister, said: "These price cuts are a severe blow for dairy farmers. Government cannot, and should not, set prices but I will do everything in my power to get all levels of the supply chain to make the real changes needed to guarantee the industry's long-term future".

A spokesman for Dairy UK, which represents milk processors, said it was working towards a voluntary code but maintained that the current dispute had been prompted by a fall in the international price of dairy products. He said: "These markets are extremely competitive and enormously volatile. We cannot insulate ourselves from world market trends."

Both Asda and the Co-op said they would increase the premium they pay to farmers but unions said this would still not be enough to cover the farmers' cost of production. At present there are more than 14 000 dairy farmers in the UK. The sector is worth an annual £3.3bn.

Source: data from The Dairy Site, reproduced with kind permission of 5m Publishing Ltd, 2010  
[www.thedairysite.com/articles/2549/dairy-farming-systems-in-Great-Britain](http://www.thedairysite.com/articles/2549/dairy-farming-systems-in-Great-Britain)  
Text adapted from 'Dairy farmers step up protest over price paid for milk',  
Helen Nugent, The Guardian, 2 July 2012

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[www.guardian.co.uk/business/2012/jul/20/dairy-farmers-protest-price-milk](http://www.guardian.co.uk/business/2012/jul/20/dairy-farmers-protest-price-milk)

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## Source E

### Organic food production down as farmers blame supermarkets for fading interest

Farmers have started to turn away from producing organic food because of dwindling interest from supermarket chains, figures reveal. Land set aside for organic cultivation in the UK has fallen by over 60% since 2007, according to DEFRA (the Department for Environment, Food and Rural Affairs).

Only 51 000 hectares were 'in conversion' – being prepared to go organic – across the UK in 2010, less than half of the amount of the previous year. Even the higher figure for 2009 was down massively on 2007 which saw a peak of 158 000 hectares being moved across according to *The Guardian*.



Organic vegetable box

### People have lost interest in organic food because of the recession

Demand for organic produce has dropped two years in a row as shoppers go for cheaper products because of the recession and higher food costs. Figures from the Soil Association earlier this year put sales down 6% from £1.84 billion to £1.73 billion. This followed a 12% drop in 2009 which brought to an end 16 years of consecutive growth.

Declining interest is blamed on the harsh economic climate as families find they can no longer afford to spend so much on groceries. As much as 10% of the land dedicated to organic production has also gone, with the number of producers falling from 7896 to 7567.

However, farmers insist that moving to organic has cut their costs and maintain that consumer interest is still strong outside the main supermarkets. Sales of organic box schemes are growing despite the recession, with key UK independent brands taking their share of a 10.3% increase. Ian Noble, representing a 12-farm co-operative in Devon, told *The Guardian*: "There might be lots of farmers who think they can't afford to go organic because they think the market is restricted but if they looked into it they would find it can be cost effective."

**Comments from two readers**

“The whole organic food industry is a sham and always was a sham, designed to fleece you out of more of your money for essentially the same food with the same nutrients, grown with ‘organic’ pesticides, marketed with pseudo-scientific babble and new age gobbledegook as healthier and better for the environment. More profits for the farmer and the supermarket and a lighter wallet for you. You would be appalled at the amount of waste the organic food industry produces compared to conventional farming.”

“The supermarkets are not stocking much organic food because there is no demand for high priced food with dubious advantages. I have tried organic food and have not been able to tell the difference except for a bigger hole in my pocket. Also, a lot of ‘organic’ food in supermarkets is from abroad and who knows how well the organic principles are controlled? Stick to fresh food, if possible locally grown, and you will do as well.”

Source: ‘Organic food production down as farmers blame supermarkets for fading interest’

Daily Mail Reporter, Mail Online, 12 August 2011

[www.dailymail.co.uk/news/article-2025276/Organic-food-production-farmers-blame-supermarkets-fading-interest.html](http://www.dailymail.co.uk/news/article-2025276/Organic-food-production-farmers-blame-supermarkets-fading-interest.html)

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