

Where does our food come from?

These resources were developed for use during Biology Week 2013, but you are free to use them at any point. The PowerPoint and the worksheets are available for you to modify, and you may wish to use parts of them in other lessons. We value your feedback, and a short survey can be found along with more resources at www.societyofbiology.org/biology-week-schools. Here you will also be able to share your pupils' views, which we may then use in blogs and articles.

Learning objectives

- Locate where your food comes from.
- Describe what the term 'food miles' means.
- Explain why some foods are sourced from abroad.
- Propose solutions to the environmental and social impacts of global food production.
- Assess possible solutions, and determine the role of consumers, farmers, retailers and scientists.

Resources provided

- Downloadable homework worksheet to be completed before the lesson
- Activities worksheet to be completed in class – distinguish between social and environmental problems; identify who is responsible for solutions
- PowerPoint to lead class discussion

Homework (set the week before)

- Pupils are asked to look in their kitchens at home for 10 items of food and to identify where each of the food products came from. Pupils should mark these countries on the world map (provided). You may wish to specify whether they should choose some single-ingredient foods which show the country of production and some which show the country of manufacture.
- We are making a list of all the countries which pupils find produce from – please enter the list of countries at www.societyofbiology.org/biology-week-schools

Lesson plan: Introduction

Discuss homework – where does the food in your kitchen come from?

- Pupils can mark on a map where one of their foods came from
- Introduce the concept of food miles. The Oxford English Dictionary defines one food mile as a mile over which a food item is transported during the journey from producer to consumer.

Specific examples

- The PowerPoint contains a few specific examples of products and, with use of a world map, demonstrates how far they travel to the UK
- Broccoli and Cauliflower – China, India, Spain. Mexico, USA
- Oranges – Brazil, USA (California and Florida), China, India, Mexico, Spain... we normally get ours from Spain when in season. The other top producers can grow oranges all year round. Brazil and the USA primarily produce oranges for juicing.
- Banana – top producers are India, China and the Philippines. We get our bananas from the Caribbean, 4600 miles away!

What might increase food miles? Answers include transport via other countries, including for processing and packaging. Food manufactured in one place can contain ingredients from all over the world.

Case study: the chocolate bar

Initial slide

- Ask pupils where they think a chocolate bar comes from
- Where was it manufactured? UK
- How many food miles?

Ingredients

- Ask them to guess the ingredients then reveal

Where the ingredients come from

After the first click the name of the location will appear. Ask the pupils if they can point to where that country is on the map and when they get it right, click again and an image of that ingredient will appear on the map.

- Cocoa – West Africa. The Ivory Coast is the world's largest producer of cocoa, followed by Indonesia, Ghana, Nigeria, Cameroon, Brazil, Ecuador and Togo. Cocoa is produced in the tropics between 10°N and 10°S where the cocoa tree is able to grow. Cocoa originates from South America. Although cocoa production has done a lot for the economy of the countries that produce it, cocoa plantations take up valuable agricultural land for a very 'Western' luxury food.
- Sugar – many Caribbean countries produce sugar as their main industry. These include Jamaica, Cuba, Barbados and Guyana (one of the few Caribbean countries that is not an island). The Caribbean's sugar industry has been under threat for a number of years from larger countries such as Brazil, India and China which represent the top producers of sugar in the world.
- Wheat – East Anglia for this particular chocolate bar but a large number of countries over the world produce wheat.
- Milk – produced across much of Europe and traded regularly within the EU, as well as exported to other countries.
- Yeast – produced in many European countries, commonly used in the production of bread and wine.
- Salt – China is the world's largest salt producer, and has been producing salt for over 4,000 years! Lake Qinghai in Qinghai province is the single largest area for production.
- Palm oil – SE Asia, Indonesia and Malaysia are the biggest producers but it is also grown in Thailand, Colombia and several African countries (it is actually the African oil palm tree that is farmed as it produces a higher yield of oil per hectare). Palm oil is used as engine lubrication, in soap and cosmetics, and in food products such as chocolate, margarine and cream cheese. It is also used to produce biodiesel. Palm oil is often labelled on produce as vegetable fat or vegetable oil but as of 2015 it will have to be labelled as palm oil. Palm oil production in Indonesia increased by 400% between 1994 and 2004. The consequence of this increase in production has been mass-deforestation and consequent habitat loss, threatening wildlife and

endangered species such as the orangutan and Sumatran tiger. The Malaysian government has placed a cap on the maximum area that can be used for oil palm growth, to support rural development. However, in Indonesia oil palm plantations have led to the displacement of

- indigenous people and conflicts have arisen. Increased GHG emission from its production is also a problem. Ironically, governments are trying to increase the proportion of Biodiesel used to reduce the impact of climate change but the use of biodiesel may actually make things worse. The growth of oil palm has allowed cheap vegetable oil to substitute for more expensive animal fats, reducing both trans-fat and cholesterol intake.
- Soya – the Mato Grosso region of Brazil is the largest producer of Soya.
- Calcium sulphate – naturally occurring mineral found in gypsum. It's commonly used as a desiccant, a substance that absorbs water and induces a state of dryness. It is common in pre-packaged foods, such as the chocolate bar. It can also be used as a coagulant in tofu.

Food Miles

- Ask pupils to guess the food miles for each product to the UK and calculate the total. You may wish to raise the point that some chocolate bars will be packaged elsewhere.
- *Some products are produced in the UK or EU so a suggested mileage is stated on the slide but this may not be entirely accurate and is dependent on which European country.

Why are different foods grown/ produced in different countries?

- Climate – the UK is too cold to grow many of the ingredients on this list. Some of the products could be grown in greenhouses but the cost and carbon footprint of using these facilities is higher than importing the produce from other countries. This is an interesting situation where shorter food miles can actually mean an increased carbon footprint. Some produce which we can grow in the UK still needs to be imported if it is to be available out of season.
- Space – these countries have a lot more land. It's no coincidence that the top producers of most food products are China, India and Brazil and this is contributing to the strength of their current economies.
- Expertise – crops may be grown in a country where they have been grown there years, so the skills and infrastructure are available.
- Cost of production – labour, for example, can be cheaper overseas.

What are the issues with sourcing these ingredients from other countries?

- Ask pupils if they can think of any issues associated with importing all these products.

Carbon footprint

- Carbon footprint is a measure of the impact our activities have on the environment. It calculates all the greenhouse gases we produce in all our activities and measures them in units of carbon dioxide. The world average is about 4,000 kg of carbon dioxide per person. In the UK it is nearly 10,000 kg per person (BBC GCSE Bitesize definition).

Issues

- Introduce pupils to some of the environmental and socio-economic issues associated with food production.
- The worksheet provided asks pupils to match chocolate bar ingredients to issues associated with their production.

Environmental

- Increasing land use for agriculture involves destroying important natural habitats such as the rainforest
 - Rainforests contain 50% of the world's fresh drinking water. Destroying them also affects climate/weather system balance
 - Palm oil plantations in Indonesia have destroyed much of the habitat for the Sumatran tiger
- Food production produces greenhouse gases and consequently contributes towards climate change, whether this is through using land which was previously forest, using fertilisers which are energetically expensive to produce, or the machinery and transport needed to run the farm.
- Transport of food throughout the world increases food's carbon footprint.

Socio-economic

- Not everyone in the world has enough to eat – as the world's population increases we are struggling to produce enough food to feed everyone.
- Food produced in the developing world is sold to the developed world – but they can't feed themselves.
- Working conditions are often poor in developing countries.
- Indigenous people have been displaced as plantation spread into their lands.
- Large plantations require fewer workers, increasing the rich/poor divide.

However, along with the social problems associated with importing food, there can be benefits to the economies of developing nations and to the livelihoods of people with agricultural jobs. Fairtrade, which sets minimum standards for the pay and conditions of workers, can increase these benefits. Fairtrade certification was designed to guarantee a fair, minimum price for products and this has benefitted many workers around the world, although there is a danger that suppliers benefit more than producers.

Solutions

Ask the pupils if they can come up with any solutions. Note: Growing food in greenhouses in the UK would decrease the carbon footprint associated with transport. However, heating a greenhouse would have a much larger carbon footprint and is therefore not a solution to the reduction of the carbon footprint of food production. This means that for some products those with shorter food miles may have a higher carbon footprint. You may wish to ask your students if they can think of any problems associated with the 'buy from closer countries' solution comes with.

The worksheet provided asks who's responsible for developing and implementing solutions to the issues.

Plenary

The fill in the blanks exercise can be done on the board or as a worksheet (separate sheet available).

- The food that finds its way into our kitchen comes from all over the world
- Where food is produced depends on climate, space, expertise, cost of production
- The biggest producers are Brazil, India and China (BRIC nations)

- Production and transport of food results in carbon emissions and often has environmental and social/economic implications
- Solutions to these issues are being developed by scientists, farmers, supermarkets, manufacturers, government, consumers

Ideas for class discussions include:

Why do you think we import so much food? Should we aim to eat more seasonal vegetables which can be grown in the UK for example?

Foods that used to be considered exotic luxuries are now common place in our supermarkets.

What can consumers do to reduce the carbon footprint of their food?

What can scientists do to reduce the environmental impact of food?

In Britain we import 40% of the total food we consume, and the proportion is rising. Is this a problem?

Here are some ideas: www.foodsecurity.ac.uk/issue/uk.html

We have looked at some of the problems of food production in the developing world – how can the UK help? Is it our responsibility to do so?

If scientists are tackling the problems we discussed, what else do they need to be aware of?

Encourage an understanding that problems shouldn't be seen in isolation – conservation schemes must be planned with an understanding of how the local community will be affected, improving crop yield must be done with an awareness of the environmental problems of farming.

Curriculum notes

This lesson draws on the key concepts of

- appreciation of different scales, from personal, local, regional, national, international and continental, to global
- the location of places and environments
- different parts of the world in their wider settings and contexts, including the European Union and regions or countries in different states of development
- interactions between people and their environments, including causes and consequences of these interactions, and how to plan for and manage their future impact
- exploring the social, economic, environmental and political connections between places