



TOPIC EXPLORATION PACK

Theme: Food security

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PROVISIONAL



GCSE (9–1) Food Preparation and Nutrition

OCR
Oxford Cambridge and RSA

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This Topic Exploration Pack accompanies the OCR resource 'Food security' learner activities, which you can download from the OCR website.

Topic: Food security

The way our food is produced is a complex system, involving many countries. Food supply is no longer a local issue and now involves international trade in commodities, crops and finished goods. For example, cocoa beans are grown and harvested in Brazil, shipped to a chocolate manufacturer in the UK where they are refined into chocolate, packaged and distributed around the world.

The dramatic rise in world population growth is forcing questions to be asked about how existing global food manufacturing practices can ensure that there is enough nutritious food available for everyone in the world. There is a need to investigate new manufacturing methods to ensure future security of our food supply chains.

The area of food security is a new topic within the new GCSE Food Preparation and Nutrition qualification. It forms part of the section on food source and supply aiming to further knowledge and understanding of the complex issues that surround the necessity to produce our food in a sustainable manner. It forms cross-links with topics taught in Biology and Geography. The learners of today need to be in a position to make informed choices about their own food purchases and allow them to take part in advocating necessary future changes within local and global markets and communities.

Useful links

United Nations food global issues: www.un.org/en/globalissues/food/

Food and Agriculture Organisation (FAO): www.fao.org/home/en/

FeedBack: <http://feedbackglobal.org/>

In this section, you will need to cover:

- What it means to live in a food-secure society:
 - Food availability
 - Food accessibility
 - Food utilisation.
- The factors that determine whether food security exists.
- The factors that can threaten international food security:
 - Increasing global population growth
 - Sensitivity to economic events
 - Sensitivity to environmental events

- What are the future food security issues for Britain?
- What can Britain do to sustain the future security of the food supply chain?

What it means to live in a food-secure society

The World Food Summit, 1996, defined food security as existing when everybody has access to enough safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

This means that food security can only happen when the following three fundamental principles are sustained all year round:

1. The **AVAILABILITY** of food
2. The **ACCESS** to food
3. An individual's ability to **UTILISE** food.

1. What factors determine the AVAILABILITY of food?

The availability of food is not only governed by how much food is *physically* available, but also by the *reliability* of the supply of that food. The degree to which a country is food secure, will depend upon the **range** and **amount** of food that it produces and the levels of **imported** and **exported** food goods to and from that country, e.g. During 2006-08, international food prices reached unprecedented levels. Small import-dependent countries, especially in Africa, were more affected by the crisis, whereas larger food-exporting countries were able to insulate themselves from potential food shortages and price shocks by imposing restrictive trade policies and protecting their consumers through safety nets.

2. What factors determine the ACCESSIBILITY of food?

The accessibility of food within a particular country is determined by:

- **Economic** factors, which include whether food is available at prices that people can afford to pay. Rises in food prices have a greater effect on low-income families, since they spend proportionately more on staple foods such as milk, eggs and bread, which are hit harder by increases in food prices.
- **Physical** factors, which include the availability of land to grow or rear food, effective trading policies and the efficient transportation and distribution of food to ensure it gets to where it is needed.

3. What factors determine food UTILISATION?

How food is utilised by an individual is determined by how well the body is nourished by the nutrients available in the food. The nutritional content of foods eaten will depend upon basic nutritional knowledge, application of healthy eating practices and good food preparation methods, as well as accessibility to a diverse range of foods.

When people are malnourished, their bodies are weakened making them more susceptible to diseases and less able to produce food and contribute to maintaining a healthy community.

Popular misconceptions

There is not enough food to feed the world

Enough food is being produced globally to feed the world, but not everyone has access to adequate nourishment to sustain an active and healthy life. Access to food can be limited by numerous environmental, social and political factors, which are discussed in detail under the section 'What factors threaten international food security?'

“A third of the world’s entire food supply could be saved by reducing waste – or enough to feed 3 billion people; and this would still leave enough surplus for countries to provide their populations with 130% of their nutritional requirements. 4600 kilocalories per day of food are harvested for every person on the planet; of these, only around 2000 on average are eaten – more than half of it is lost on the way”. (Tristram Stuart 2009, Waste: Uncovering the Global Food Scandal).

All food insecure people are hungry

Whilst it is true that hunger is a result of food insecurity, it is not true to say that all food insecure people are hungry. On a global scale, food consumption is very uneven, with some areas of the world being undernourished, whereas other regions are over consuming food. Hunger results in malnutrition due to an individual having a deficiency of particular nutrients. Malnutrition, however, could also be caused by unhealthy eating practices in communities which receive excessive quantities of food, e.g. changing Western diets have seen a rise in obesity rates due to an imbalance of sugar and fat intakes. Good nutrition relies on receiving the correct combination of nutrients and calories needed for healthy development.

What factors threaten international food security?

The food supply chain will be threatened if countries are not resilient to changes that occur due to population growth, economic or environmental issues.

a. Increasing global population growth

It is predicted that the world population will rise from 7.2 billion today to 9.7 billion by 2050, resulting in the need to feed another two and a half billion mouths over the next 35 years. The largest region of population growth is expected to occur in Africa, one of the world's less-developed continents. Asia accounts for 60% of the world population, with India predicted to outgrow China within the next 15 years. (2014 World Population Data Sheet).

As a country's population urbanises, then more land will be used for housing, which previously may have been used for growing or rearing food.

b. Sensitivity to economic events

Increased income: People in some countries, such as Brazil and China, are becoming richer. As the income of these people increases, there has been a greater demand for meat and dairy products. The greatest rise in the consumption of these products has been seen in developing countries, where the population growth is predicted to increase the most over the next 30 to 40 years. Production of meat and dairy is an inefficient way of feeding a growing population as it requires more land space than growing crops. The animals eat the grain that could have been sold on the market. It takes five times as much grain to produce one kilo of meat.

Increased food prices: Food trade is now an international affair, which can serve to stabilise supply when local weather or growing conditions are negatively impacted. A sharp increase in global food prices has been seen, however, over the past few years and food prices are predicted to rise faster than incomes every year until 2018.

This rise in food prices has highlighted the fact that international food trade can also destabilise prices. The reason why this is happening is due to the fact that price is governed by supply and demand:

- Prices rise when there is an increased demand for a food commodity
- Prices rise when there is a fall in the supply of a food commodity.

So what is happening to cause changes in the supply and demand of our food?

- *The rapidly growing populations* of China and India have increased demand for food from other parts of the world, which has driven up prices.
- *Natural disasters*, e.g. the Japanese tsunami and earthquake in 2011 drove up seafood prices by nearly 6%, due to reduced supply of fish stocks.
- *Climate changes*, e.g. in 2014 Australia experienced widespread drought which affected the profits of livestock producers and contributed to a decline in farm production. Droughts are expected to become more frequent in future years, especially in farming areas such as sub-Saharan Africa.
- *Government ethanol subsidies*, e.g. the USA and EU have both implemented subsidies to encourage ethanol usage as an alternative to oil. The latter have also instigated policies to enforce an increasing percentage of future oil supply to come from ethanol. This has increased the demand for corn production to be used in the manufacture of ethanol, which in turn has resulted in a reduction of land available which is normally dedicated to food production. The effect of this is higher food prices.
- *Farming subsidies* can have a negative impact on food prices, e.g. in the USA, subsidies on corn has resulted in the production of many unhealthy cheap corn-based food products, as evidenced in the presence of high-fructose corn syrup in many of their processed foods. Low income families are less likely to therefore choose nutritious foods.
- *Increased oil prices* have pushed up food prices due to increases in transportation, fertilizer and plastic packaging costs, since these all rely on the use of oil.
- *Import tariffs and export taxes* distort supply and demand, and hence food prices around the world, e.g. by restricting its export a country can increase the global price of a particular commodity that they supply a significant share of to the global market.

Increased animal feed prices: Volatile global markets for products such as animal feed have strong impacts on the price of meat and dairy. The rising costs of grain for feedstock have increased prices on beef and pork.

Pressure on food producers to provide food at lower prices has resulted in food scares, e.g. the horse meat scandal, where horsemeat was discovered in processed beef products sold across a number of UK supermarket chains. Retailers have been blamed for regularly driving meat prices below the cost of production, resulting in adulteration of the product content and a lapse in quality control by the food manufacturers.

Reduction in public funding of agricultural research by successive governments is viewed to have set British farming back and penalised the UK farmers in relation to those in the EU.

E.g. the small number of root stocks on which certain tree fruits are now grown commercially was identified as a risk in the face of unpredictable climate change. Commercially grown apples mainly use just three rootstocks, out of a possible forty or fifty. Funding is needed to enable research to be carried out to identify rootstocks that would enable fruit trees to better withstand the possible effects of climate change, including both drought and soil water-logging.

c. Sensitivity to environmental events

It is difficult to create sustainable economic development without causing sacrifices to the environment. Technological developments in food production can have negative impacts on the environment, which in turn affects the availability of food sources.

Depleting energy resources: Food production relies on the use of fossil fuels to create energy for manufacturing. Alternative sources of energy will need to be increasingly used as this finite source of energy eventually runs out.

Carbon emissions are increasing worldwide, by more than 50% since 1990, as fossil fuels continue to be used. Increases in carbon have a significant impact on the climatic changes which our planet is experiencing. The United States and other developed countries have the highest emissions, but the growth in emissions in countries such as China, have been particularly striking, being one of the consequences of rapid economic and human development progression.

Climate change is significantly affecting food production yields, e.g. too much or too little rain can reduce harvest.

Water scarcity has a huge impact on food production. Agriculture is the greatest user of water worldwide, accounting for an estimated 70% of potable global water use, with livestock playing a significant part in that.

Soil management is the basis for good food production. Soil health needs to be protected by good management and conservation. The use of chemical pesticides can have a negative impact on the environment.

Depleting food resources: As population growth increases there are pressures to catch food on larger scales, which have resulted in overfishing depleting fish stocks to levels that may not be able to recover.

Depleting biodiversity: As population growth increases there are pressures to clear land to grow crops or rear livestock, resulting in a loss of native habitats, which in turn can negatively impact climate change.

Emerging diseases: the necessity to intensively farm animals or crops, to meet the demands of a growing population, can impact on health since diseases spread more quickly and this increases the need to use antibiotics or pesticides.

Emerging exotic diseases such as bluetongue and African swine fever threaten to devastate livestock industries. The bluetongue virus mostly affects sheep and is transmitted by the *Culicoides* biting midge. As global weather conditions have warmed in recent years, the geographical range of the midge has spread north, arriving in the Netherlands in 2006 and with the first confirmed outbreak in the UK in 2007. Since then, the disease has gone on to strike Norway in 2009. The culling of diseased livestock has a knock-on effect on other meat prices, sending them spiralling.

Decline in the populations of insect pollinators, such as bees, moths and butterflies has been observed around the world. A third of crops are pollinated by insects, and further declines could lead to higher food costs and potential shortages.

Threats to the access of British food

The balance between imported and exported goods: The UK is only about 60% self-sufficient in total food production, and has to import about 40% of the total food consumed. The proportion of imported food is rising, making Britain more reliant on both imports and thriving export markets to feed itself and drive economic growth. The reliance on exported foods provides the UK with a diversity of supply, which consumers of today have come to expect. We must be careful, however, not to become vulnerable to factors outside the Government's control if this trend continues.

Local, seasonal foods: British consumers are being encouraged to buy more UK-grown produce and promote natural ways of growing food, which are sustainable, seasonal and fresh. Britain must be careful not to jeopardise its food security by relying on vast imports of fruit and vegetables from overseas that could be produced in this country. E.g. even in the peak growing season of 2013 the

UK imported over 30,000 tonnes each of onions, tomatoes and apples, 20,000 tonnes of cauliflower and broccoli and over 50,000 tonnes of potatoes every month.

The cheap food culture that has dominated the UK over the past 30 years, needs to be questioned. Britain cannot expect to import all it wants, even if it can pay for such imports, e.g. it makes no sense for a vegetable grown half-way around the world (harvested, packaged, stored, transported, marketed, distributed) to cost less than a vegetable grown and sold close to home. Thanet Earth is a large greenhouse complex in Kent, which now produces about one third of Britain's cucumbers and tomatoes. Efforts to increase UK production are, however, being constrained by intense competition in supermarkets where price is a far bigger motivating factor than country of origin.

Local climate change is becoming more of an issue in the UK, with warmer, wetter winters being forecast alongside drier summers. Changes in the climatic conditions are likely to change the range and types of UK pests, diseases and weeds. Warmer winters could improve survival in resistant pest populations, e.g. the severity of phoma stem canker epidemics in oilseed rape crops is predicted to increase, which will result in yield losses.

Britain's livestock and dairy industry is heavily dependent on imported soybean for animal feed, the price of which is likely to be affected by growing demand from China, India and parts of Africa. Alternative animal feeds need to be sought.

Organic and free range foods are growing in popularity, but their production cannot sustain a growing population.

Genetically modified foods are not currently ably the general public in the UK, but their use may become inevitable in the future to help improve yields and reduce food wastage.

Food wastage: In the United Kingdom households waste a large percentage of all the food they buy. There are numerous reasons why this happens, including too much food being cooked and not being eaten in time.

What can Britain do to sustain the future security of the food supply chain?

- We need to explore ways in which we can use available land space efficiently to ensure we can feed the growing population, e.g. use of aquaponics which is a way of growing fish and vegetables in an integrated system.
- We need to reduce meat and dairy consumption and find alternative sources for our protein requirements, e.g. insects. The consumption of bugs is already included in the diet of many nations, but the western world have been slower to replica these practices.
- We need to eat fish that are not on the endangered list.
- We need to investigate the potential benefits of genetically modified foods to enable crops to be grown that will better withstand future fluctuations in climatic conditions.
- We need to reduce the energy consumption/carbon footprint of the food we purchase by consuming more local and seasonal foods and reducing the consumption of food that either has travelled long distances or been produced using energy inefficient methods.
- We need to buy more organic foods to reduce the use of synthetic fertilisers to keep soil healthy and guarantee high animal welfare standards.
- We need to look at our purchasing patterns and lifestyle to determine ways that we can reduce food and packaging wastage.
- We need to compost food and recycle packaging materials.
- We need to eat less highly processed foods and ensure that we consume a balanced diet.
- We need to buy Fairtrade foods to support sustainable practices.

Teacher-led student activities

1. Ask your students to discuss how the expected growth in the world population is likely to impact on food security in regards to the availability, access and utilisation of food.
2. Ask your students to discuss how much food the UK should produce? Are there optimum and sustainable levels of self-sufficiency? How resilient is the UK's present-day food supply and how does it look for the foreseeable future?

3. Ask your students to each carry out research on a different food manufacturer's website, e.g. Coca cola, McDonald's, Kellogg, Innocent, Birds Eye, to investigate what food manufacturers are doing to contribute towards the sustainable production of their food products. Ask students to present their findings.
 - www.coca-cola.co.uk
 - www.mcdonalds.co.uk
 - www.kelloggs.co.uk
 - www.innocentdrinks.co.uk
 - www.birdseye.co.uk
4. Ask your students to look at the FeedBack website (<http://feedbackglobal.org/>) to investigate campaigns that have been introduced to reduce food wastage.
5. Ask your students to design recipes from leftover foods, e.g. mashed potato, chicken left over from a roast, cooked rice.
6. Ask your students to look at a range of staple foods: wheat, rice, corn, oats, barley, soybeans, potatoes and investigate what would happen if the supply of that staple food was limited or threatened. Which products would be affected worldwide? What affect would this have on trade? What would be the nutritional consequences of a reduced supply of these foods?
7. Ask your students to look at a range of food labels to determine where our food is coming from and which foods have travelled the longest distance. Ask students to compare prices.
8. Ask your students to discuss the ways that energy could be conserved in the preparation, cooking and storage of food.
9. Ask your students to hold a debate on the following topics:
 - The advantages and disadvantages of genetically modified foods
 - The nutritional advantages of eating fish versus the problems of overfishing
 - The advantages of eating locally produced products versus the need to fairly support the trade of developing countries
 - Does a healthy diet cost more than an unhealthy diet?

Suggested answers

Student Worksheet 1 – What is food security?

Use the words in the box to complete the sentences below.

food prices	access	distributed
availability	environmental	undernourished
malnutrition	nourished	population growth

Food security is the state of having **access** to enough healthy and affordable food around the world to live a fully **nourished** lifestyle. There is enough food being produced in the world to feed everyone in it, but it is not **distributed** properly. This is due to numerous factors including rising global **population growth**, increased **food prices** and reduced **availability** of food as a consequence of **environmental** issues. This can lead to people in some areas of the world being **undernourished** due to hunger. People who live in countries where food is abundant, however, are not necessarily food secure, since poor diets can also lead to **malnutrition**.

Student Worksheet 2 – Food wastage

*“If **wastage** levels by consumers of around a quarter of all food is representative – as found by WRAP’s study in the UK and by the Department of Agriculture in the US – this would suggest that **10 per cent of all greenhouse gas emissions** in these countries comes from producing, transporting, storing and preparing food that is never eaten”.*

Tristram Stuart 2009, Waste: Uncovering the Global Food Scandal.

With reference to the above quote, discuss the reasons why food wastage occurs and systems that could be implemented to prevent it.

Discuss how food wastage has a negative impact on the environment.

Answers could include:

- People buying food in bulk, which expires its use by/best before date before it is eaten.
- Cosmetic standards on vegetables by supermarket chains resulting in wonky vegetables being thrown away.
- Crops being left to rot in fields and not harvested due to over production.
- Wastage during processing.
- Deterioration of food being stored due to pests or microbial spoilage.
- Contaminated food by physical, chemical or microbial means, resulting in products needing to be thrown away.
- Damaged packaging causing food to become contaminated.
- Expired or damaged packaged foods are left for animal feed.
- Poor sales of products resulting in leftover food.
- Natural disasters resulting in food losses, e.g. flooding of crops, food scares in livestock resulting in the need to cull animals.
- Too much food being cooked or not being eaten in time.

Environmental impact:

- Waste of finite resources, e.g. land space, energy and water. The waste of good food and drink is associated with 4% of the UK's total water footprint.
- Increased methane from rotting food.



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