

# Eating for the environment



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# Introduction

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Many discourses on food security have focused on feeding 9 billion people by 2050. Organisations such as the World Bank have picked up this challenge and directed their investment in agriculture to produce more food to feed more people (World Bank, 2012). The focus on increasing the production of food is now deep-rooted within food policy. However, food security is more than just production, supply and consumption of food. In this free course, *Eating for the environment*, you will explore other dimensions of food security. These include the need to provide adequate and appropriate nutrition in addition to the quantity of food required to sustain a healthy human diet.

To sustain a healthy human diet, it is not just the quantity of food that is important, but adequate and appropriate nutrition is also essential. For over 800 million people in the world, access to sufficient and nutritious food is a serious problem (FAO et al., 2017). Even though the policies on food focus on feeding 9 billion people by 2050, in reality food is not distributed equally and some people have poorer access to food than others.

In addition to the accessibility of food, affordability is also important. However, for hundreds of millions of people in the world, the cost of sufficient and nutritious food can be prohibitive. In this course, you will explore how much a balanced dinner plate costs in different countries to examine how affordable nutritious food is to people from around the world.

Traditional, cultural and spiritual associations of food are also important, because food pervades deeply into the organisation of human society and the food you eat is strongly influenced by where you live. In this course you will explore a diversity of diets from around the world. Collectively, this course will highlight geographical differences in availability, access and affordability of sufficient and nutritious food.

This OpenLearn course is an adapted extract from the Open University course [SDT306 Environment: responding to change](#).



# Learning Outcomes

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After studying this course, you should be able to:

- identify the diversity of ingredients on dinner plates from around the world
- list the ingredients of a dinner plate and place them on the taxonomic tree
- recognise traditional and cultural associations of food
- identify geographical origins of different foods and intellectual property rights over them
- explore the links between food choices and environmental sustainability.

# 1 Nutrition security

Nutrition security is vitally important for health and well-being. A lack of nutrition security manifests in malnutrition caused by not eating enough of the right things necessary for an active and healthy life. A nutritious diet consists of macronutrients (carbohydrates, proteins and fats) in certain proportions, and a wide range of micronutrients (vitamins and minerals). But does the current global food production address these nutritional needs? Unfortunately, it does not. The 2017 Global Nutrition Report suggests that nutrition is still a large-scale and universal problem (Development Initiatives, 2017).

The global contradictions in the availability of food result in the double burden of malnutrition characterised by the coexistence of under-nutrition, along with overweight, obesity, or diet-related, non-communicable diseases. According to the World Health Organisation (WHO), 1.9 billion adults in the world are overweight and over 600 million of those are obese. At the same time, 600 million adults are underweight and 264 million women of reproductive age are affected by anaemia due to iron deficiency in their diet (WHO, 2017). WHO also estimates that 41 million children in the world under the age of five are overweight or obese, while 155 million children in the same age group are too short for their age and a further 52 million children in this age group are too thin for their height (WHO, 2017). The problem of malnutrition goes hand-in-hand with poverty and poverty makes nutritious food unaffordable.

In Activity 1, you will use the UK National Health Service guidelines for a balanced diet to assess the affordability of a nutritious dinner plate in different parts of the world.

## Activity 1 How much does a balanced dinner plate cost?

Allow around 1 hour

Interactive content is not available in this format.

**Figure 1** A summary of NHS Eatwell recommendations. Click on a food group label to see more information about the contents of that group.

The main purpose of this activity is to compare a UK dinner plate with the dinner plate in a low-income country in terms of proportion of household income spent.

To begin, based on the recommended proportions in this [NHS Eat Well Guide](#), calculate how much a balanced dinner plate will cost (per person) where you live. If you wish, you can choose a [specific healthy recipe](#) or choose the ingredients for a healthy meal that you can make already.

You may have an old shopping receipt that you can use to help you price your ingredients, or access to an online supermarket service that you can use for your estimates. Likewise, the [Numbeo website](#) provides information about the average cost of living in different parts of the world, including some typical food prices.

Once you have an estimate for the total cost of your meal, the next step is to compare it with some other values.

1. First, calculate how the cost of your meal compares with monthly rent or mortgage prices for the area in which you live. Again, Numbeo may provide some

useful data here, or you can base your calculation on your own experience of renting or owning a home.

2. Now compare the cost of the same sort of dinner in a city within a low-income country (for example, Awassa in Ethiopia). You may have to do some additional online research to find approximate values for the same set of ingredients as you used for your initial analysis. Don't worry if you can't find exact prices for all of the ingredients – you only need indicative values for the purpose of this activity. How does the costs of the meal compare across the two locations?
3. Finally, determine the average monthly rent or mortgage costs in the low-income location that you chose, and compare this with the cost of the meal in the same location.

Briefly summarise the outcomes of your analysis of the relative costs of food in the two locations you have studied. (Answer in fewer than 150 words.) An example answer, from a respondent based on Milton Keynes, UK, is provided below.

*Provide your answer...*

#### Answer

This example answer is based on comparing the cost of living in a central apartment in Milton Keynes (i.e. around 4 km from the site of the OU's main campus) and in Awassa, also referred to as Hawassa, in Ethiopia.

According to the Numbeo website (2019), a three-course meal in a mid-range restaurant in central Milton Keynes can cost about £20 per person. In Awassa it is approximately £9.50.

Similarly, monthly rent of a one-bedroom, central apartment in Milton Keynes is roughly £825, compared to £125 in Awassa.

Therefore, the cost of a healthy meal in Milton Keynes is around 2.4% (about 1/40th) that of the rent, and in Awassa it is 7.6% (1/13th) of the rent. On the basis of this analysis, a person in this part of Ethiopia will have to spend much more on healthy food than a person in Milton Keynes.

Next you will look at the diversity of diets around the world and how dietary preferences impact food security.

## 2 Dietary choices and preferences

As much as the affordability of food, what people eat is also strongly influenced by their dietary preferences, which are in turn closely connected to behavioural, cultural, religious and social factors (Mintz and Du Bois, 2002). These factors add other dimensions to food security. To fulfil these dimensions, emphasis on production alone is not sufficient. In Activity 2, you will get a sense of the diversity of diets, dietary choices and preferences around the world.

### Activity 2 Dinner plates around the world

Allow around 1 hour

This activity asks you to read an article that describes a number of meal types and eating practices from around the world in the context of how our ancestors ate. Please note that there are some images in the associated picture galleries of animal species being caught or eaten by humans. If these are likely to offend you then we advise you to skim quickly past the galleries and concentrate on the text, instead. Equally, you can skip this activity if you wish.

#### Task 1

Access and read the 2014 National Geographic magazine feature on the [‘Evolution of Diet’](#), which describes a number of meal types and eating practices from around the world in the context of how our ancestors ate. As you read, make brief notes about how the dinner plates described compare in their content with your typical dinner plate, and with the [NHS Eatwell Guide](#) recommendations.

You can make notes below, if you wish.

*Provide your answer...*

#### Task 2

Think about how the geographical and cultural environment where people live influences what they eat. Write a summary of how your dinner plate is different in its content from other dinner plates around the world and comment on the usefulness of NHS recommendations in those parts of the world. (Answer in fewer than 200 words.)

*Provide your answer...*

#### Discussion

The *National Geographic* feature displays a wide diversity of dinner plates, each very different in their composition. These diets are deeply influenced by environmental, cultural, religious and social factors, and they rarely meet the NHS guidelines on a healthy diet.

However, the meals described often consist of fresh and healthy (e.g. non-processed) ingredients. Even though individual dinner plates do not represent a healthy diet as defined by the NHS, these communities around the world depend on seasonal foods to fulfil their dietary and nutritional requirements during the course of a year.



So, food and nutrition security needs to be looked at over the longer term and in the context of other influences on people's dietary needs and choices.

Next you will look at your own dinner plate and compare it with others that you came across in Activity 2.

## 3 'You are what you eat'

To consider dietary sustainability it is first important to think about what you eat. One of the techniques used to record dietary intake is a food diary. This involves noting down what someone has eaten over a given period, with an accompanying estimate of portion size. Activity 3 explains this process further. You will use the data you collect here in Activity 5 also.

### Activity 3 Making a food diary

Allow around 30 minutes

Produce a food diary entry to record all the food and drink that you, or a friend or relative, have eaten during a single day. It may be useful to record this in a spreadsheet like in Figure 2.

Now estimate the size (mass) of each item consumed with the aid of the following resource: [Find your balance: Get portion wise!](#)

Add the portion size data to your diary, as per Figure 2. Remember to separate out the component elements of what you ate, as far as possible, where a single foodstuff or meal contains multiple ingredients.

	A	B	C	D
1	Name: A. Student			
2	Date: 13 September			
3				
4	Meal component	Ingredients	Amount	Notes
5	baked beans (200 g tin)	navy beans	150 g	estimated, cooked (dried)
6		tomatoes	50 g	estimated
7		salt	<1 g	
8		sugar	<1 g	
9		maize thickener	<1 g	
10	2 pieces of toast	wheat flour	90 g	
11		yeast	<1 g	
12				
13	orange juice	orange juice	250 g	converted from 250 ml
14				
15				
16				
17				

**Figure 2** An example part of a food diary

It is important to note that there is no standard view on portion size, and the BNF (2019) table is a (UK-based) guide to what represents a portion of each foodstuff. You can find additional sources used for the quantification of portion size on the internet if the table does not list the foods you have eaten. If this is the case, make sure that you

cite the source(s) used in the estimations of portion size alongside your food diary so it is clear where your information has come from. Likewise, for single-ingredient foods like a piece of fruit, you could weigh the item before eating it, and record this as the size of that portion.

When you have completed your food diary entry, reflect on the following questions:

- How straightforward was it to match what you recorded in your diary to the categories in the table?
- How easy was it to estimate portion size of the food eaten?

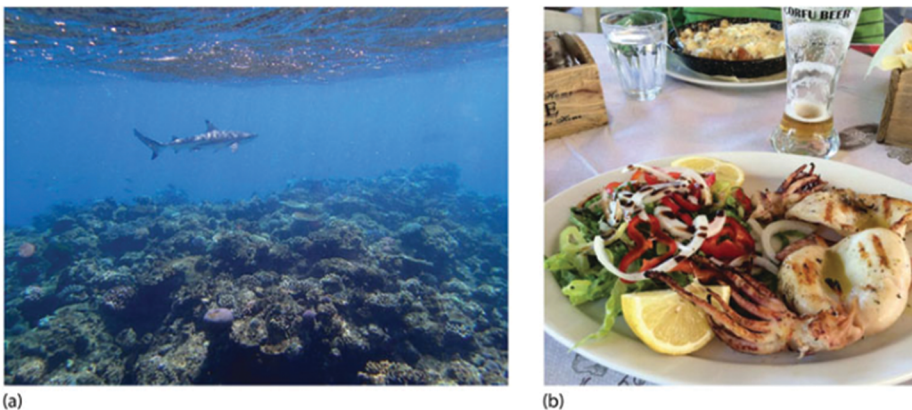
*Provide your answer...*

Nex you will look at how much variety there is on your dinner plate.

## 4 Diversity on your dinner plate

If asked to imagine ‘Where would you find high biodiversity?’ many people might think of an exotic place – animals in a rainforest or a riot of colourful fish on a coral reef perhaps (Figure 3). You are, however, exposed to a large diversity of species every day – in the food you eat.

You can use your diet to explore the diversity of species and from this can learn about key concepts relating to species classification, which can then be applied to biodiversity in natural systems.



**Figure 3** A diversity of species can be found (a) in natural systems and (b) on a dinner plate .

Although your food is usually sourced from many locations – and hence your diet is unlikely to represent the biodiversity of a particular area – it is a useful way to explore relationships between different living things. It is also important to note that a diet with higher biodiversity does not necessarily imply a healthier diet; food is simply being used here as a tasty way to explore some key scientific concepts.

Next you will explore the diversity of plant and animal species that your food comes from.

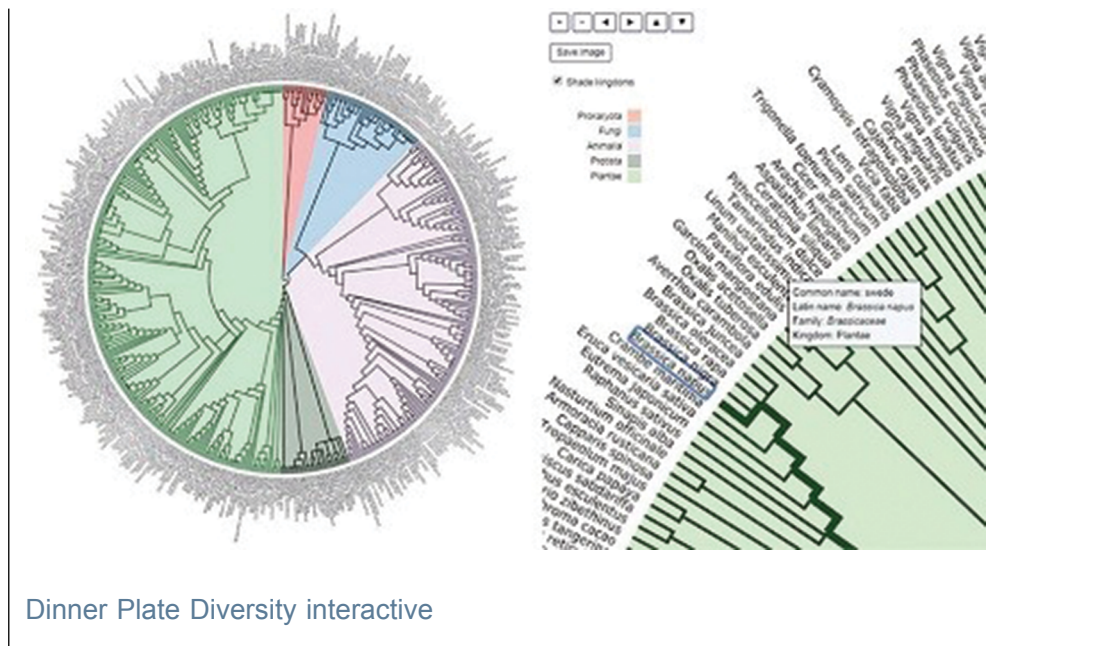
### 4.1 Exploring Dinner Plate Diversity

You will now use the Dinner Plate Diversity interactive tree to help you explore the biodiversity found in the food you eat. The resource presents over 750 of the more common species that humans eat, in a way that allows you to look at how closely related species are to each other. (Note: the inclusion of a species in this tree is not a recommendation that you should necessarily eat all of these species). The species are arranged so that the more closely related any two species are, the shorter the length the branches that join them to a common node. This type of diagram is called a phylogenetic tree.

Now click ‘View interactive version’ to access the Dinner Plate Diversity tree. You will be using this in the following sections so you should open the link in a new browser window or tab so you can follow the instructions in the course at the same time.

Interactive content is not available in this format.





Note that the following sections are best undertaken on a computer or tablet, rather than a phone or a similar device with a small screen.

You can see that five kingdom taxons are shaded: Prokaryota, Fungi, Animalia, Protista and Plantae. Some of these names might be rather familiar or intuitive – the Plantae or plant kingdom includes all plants, Animalia or animal kingdom includes all animals, and the Fungi family consists of all fungal species.

Protista includes eukaryotic organism, in which cells have nuclei but it is not an animal, plant or fungus. It is not a natural group, or clade, since they have no common characteristic origin, but, they are often grouped together for convenience. This kingdom also includes the red and brown algae.

The Prokaryota includes unicellular organisms that lack a membrane-bound nucleus, such as bacteria.

It is important to note that the relative number of species in each of these groups in the edible species tree is very different from the distribution in global biodiversity, and different again from those that are described by taxonomists. For example, it is estimated that there are about 7 770 000 species of animals, 611 000 species of fungi and 298 000 species of plants (Mora et al., 2011), giving a ratio of roughly 26 : 2 : 1, respectively. This breakdown is very different from the proportions shown in the screenshot above..

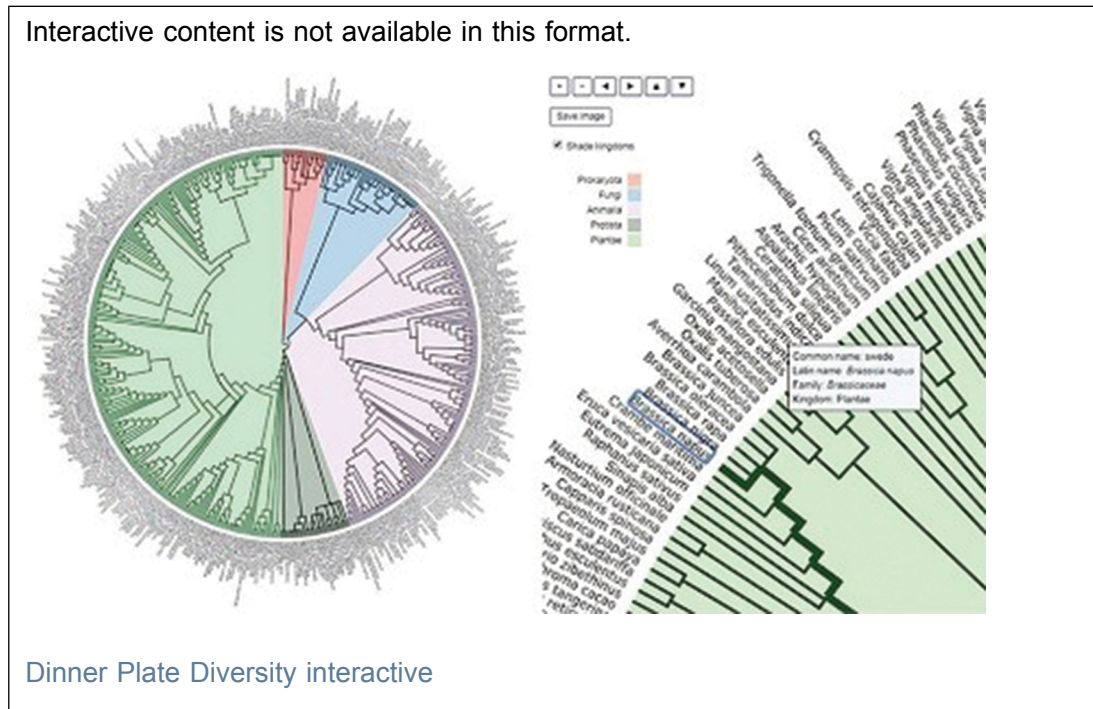
It is also notable that two kingdoms are missing: Protozoa and Chromista. While you probably ingest some of these predominantly microscopic organisms in your diet, they are not generally intentional ingredients and are therefore excluded from the interactive tree.

Next you will explore the taxonomy of, or relatedness among, plant and animal species that make up your dinner plate.

## 4.2 The diversity of edible species

You will now familiarise yourself with the Dinner Plate Diversity tree and how it can be used to study dietary diversity.

Click 'View interactive version' if you do not currently have the interactive open. You should open the link in a new browser window or tab.



In the menu on the right-hand side of the interface, foods and species are available to select from drop-down lists. They are listed here by their common name, and when a selection is made (by clicking on the checkbox next to the item in question), that species is highlighted and its scientific name is given on the tree diagram. The species names are necessarily small, to fit them all in, but there are zoom in ('+') and zoom out ('-') controls that will allow you to see things in more or less detail, as required.

A text box also appears when a checkbox is ticked. This box provides more taxonomic information, including the relevant family and kingdom. These details may be useful as you explore the diversity of what people eat. At times only a genus name is given, often because many species in this genus are eaten with little distinction between them by consumers. Anchovies are an example of this, as while there are six commonly eaten species (all in the *Engraulis* genus), the species information is often not identified in ingredients lists, so this selection only appears as *Engraulis*.

You will need to input primary ingredients or the species from which they are derived when exploring the foods in a diet. For example, milk comes from cows, honey from bees, and coconut water from coconuts, so you would need to select these species from the lists in order to include their associated produce in any dietary diversity analysis. Similarly, ingredients listed in a recipe may still need to be considered as their components. For example, pomegranate molasses includes pomegranate, sugar and lemon (juice). You may have to do a little research online to help unpack the components of a given ingredient.

Given the many species on the list, there is a search function in the right-hand menu that can help you find food efficiently. If your edible species doesn't show up there, you can search for them manually using the various drop-down lists below the search box. There are several common foods in the 'miscellaneous category' at the bottom, such as coffee and sugar, so don't forget to check that one too if they form part of the diet you are analysing.

There is also an 'Export' button that allows you to access details of any checkboxes that you have got ticked at that particular moment, in order to copy them into a spreadsheet program. You may find this feature useful if you want to compare the taxonomy of several species at once.

### Activity 4 Exploring the diversity of edible species

Allow around 30 minutes.

There are now five tasks to complete to help you explore the tree and learn a bit more about the biodiversity of different diets. Note your answers down in the boxes available after each. There is a 'Clear all' button in the right-hand menu of the interactive, which you can use to clear all your previous selections between questions. You can write as much or as little as you like, but word-count guidance is provided to help with time management.

#### Question 1

Compare the dietary diversity of someone who likes bananas, guava and watermelon with someone who likes apples, strawberries and plums. Note down the family each species is from to help you describe what you find. (75 words)

*Provide your answer...*

#### Answer

Apples, strawberries and plums are all in the Rosaceae family, meaning they are quite closely related. In contrast, bananas, guavas and watermelon are in the Musaceae, Myrtaceae and Cucurbitaceae families, respectively. From a phylogenetic perspective, this is therefore a much more diverse set of fruits. In line with this higher diversity, you may have also noted that they are much more spread out on the tree diagram than are apples, strawberries and plums.

#### Question 2

What other edible species are in the Cucurbitaceae family? (Hover your mouse over the watermelon and surrounding species in order to view the text box that contains further information. You can also zoom in to see the surrounding species more easily.) (50 words)

*Provide your answer...*

#### Answer

The commonly eaten species in the Cucurbitaceae family include cucumber, zucchini, watermelon, winter melon, and butternut squash. Interestingly, this family includes things which are commonly referred to as both fruits and vegetables even though scientifically they are all fruits.

#### Question 3

Look at the number of species in the 'Poultry, meat and dairy' category in comparison to the 'Fish' and 'Shellfish' categories. (You don't need to count them exactly, just consider their relative numbers.) Select those that you think are domestic animals from

these lists, note which family they are in, and describe where the domestic animals fit into the larger list of all animals on the tree. (100 words)

*Provide your answer...*

#### Answer

Domestic animals include cows, sheep, pigs, goat, chicken, duck, geese and possibly rabbit. Although fish and other aquatic food are farmed there are no domestic species of fish and shellfish.

The diversity of fish and shellfish that people can eat is much greater than the number of species of mammals and birds. The domestic animals we eat are in five families: Bovidae (cows, goats, sheep), Suidae (pigs), Leporidae (rabbits), Anatidae (ducks, geese) and Phasianidae (chicken). The mammals are clustered together and the birds are in a different cluster, reflecting their relatedness.

#### Question 4

Select the following foods: broccoli, brussel sprouts, cauliflower, kohlrabi and kale. What do you notice about their diversity? (50 words)

*Provide your answer...*

#### Answer

All of these foods are the same species. They have been selectively bred over many years to produce different strains in which different plant parts have sought-after characteristics. In broccoli and cauliflower you eat the flower buds, brussel sprouts are lateral leaf buds, cabbage is the terminal bud, kohlrabi is the stem and kale is the leaves.

#### Question 5

Salt and black pepper are common condiments. How do they fit into this tree? (50 words)

*Provide your answer...*

#### Answer

Black pepper is the only species in the Piperaceae family on the tree. Salt is not on the tree as it is not an edible species – it is a chemical compound and the salt you eat comes from inorganic, non-living sources.

You should now have a better understanding of species being closely or distantly related, and how to describe this using terms such as 'family', 'genus' and 'kingdom'. Activity 4 may also have given you some surprises about the species you eat (such as broccoli), which made you think more deeply about the food on your plate. This activity was about a



range of edible species, which you may or may not eat, but next you will look at the species from the dietary data that you have gathered yourself.

## 4.3 The biodiversity of your diet

Now it is time to use the food you were asked to record for a day in Activity 3 to look at the biodiversity of your own diet, or that of someone you know well (or you could use the ingredients list of a recipe if you didn't record a diary). Activity 5 guides you through this process.

### Activity 5 Explore the diversity of your diet for a day

Allow around 45 minutes.

#### Task 1

First, access the food diary that you produced for a day. Then open the [Dinner Plate Diversity interactive](#) and complete the following steps.

- Select the species eaten during that day, using the drop-down lists in the food categories or the search function. Remember that you may need to further split some foods down into their component ingredients or sources, in order to record them in the checkboxes available.
- Save a copy of the resulting tree using the 'Save image' button.
- Now download the list of species you have eaten, using the 'Export' button. Copy the data into your preferred spreadsheet software.
- Finally, use the sorting tools in your spreadsheet program to order your species by kingdom, family and genus. (Consult the 'Help' function within the spreadsheet program if you need more information about how to do this.)

#### Task 2

Summarise the diversity of the things you ate that day by filling in the box below.

Number of kingdoms:  
Number of families:  
Number of species:

#### Task 3

Write a summary of your diet for the day. Were you surprised by how many species you ate in a day?

*Provide your answer...*

Next you will look at the associations between food, culture and traditions.

## 5 Food, culture and traditions

Many food recipes are passed down through the generations. Many recipes are also based on particular varieties of plants (e.g. jasmine rice, a variety of *Oryza sativa* grown in Thailand, Cambodia, Laos and Vietnam) or breeds of animals (e.g. Angus, a breed of cattle, *Bos taurus*, bred in the counties of Aberdeenshire and Angus in Scotland). Some recipes also derive from particular fungi (e.g. Shiitake, *Lentinula edodes*, a type of mushroom native to East Asia and served in Japanese miso soup) and even microorganisms (e.g. lactic acid bacteria from genus *Lactobacillus* play an important role in cheese-making).



**Figure 4** Wild Shiitake Mushroom (*Lentinula edodes*), which grows on dead wood, is a popular ingredient in Japanese cuisine

Food traditions differ from region to region, and sometimes even household to household, and make use of specific ingredients or a combination of ingredients. The diversity of ingredients used in traditional food is closely linked to 'agrobiodiversity'. FAO (1999) defines agrobiodiversity as follows:

The variety and variability of animals, plants and micro-organisms that are used directly or indirectly for food and agriculture, including crops, livestock, forestry and fisheries. It comprises the diversity of genetic resources (varieties, breeds) and species used for food, fodder, fibre, fuel and pharmaceuticals. It also includes the diversity of non-harvested species that support production (soil micro-organisms, predators, pollinators), and those in the wider environment that support agro-ecosystems (agricultural, pastoral, forest and aquatic) as well as the diversity of the agro-ecosystems.

According to McCouch et al. (2013), the world depends on fewer than a dozen of approximately 300 000 species of flowering plants for 80% of human calorie intake. A vast

genetic diversity that each of these 300 000 species possess therefore remains untapped. McCouch and colleagues (2013) call for a more concerted global effort to make better use of agrobiodiversity in the global food supply. In the following activity, you will explore this agrobiodiversity in eight example landscapes from around the world.

### Activity 6 Landscapes for agrobiodiversity

Allow around 1 hour

A booklet called '[Landscapes for Agrobiodiversity](#)' published by the Platform for Agrobiodiversity Research provides information about agrobiodiversity in eight of the world's landscapes. These landscapes, all in low-income countries, have protected dozens of varieties of crops used in everyday diets in the UK. Use this booklet to think about the ingredients in a typical UK diet compared with those described in the eight landscapes in low-income countries around the world. For example, you might want to focus on particular crops – such as potato, rice or chilli – to help you compare and contrast the varieties used in a typical diet in high- and low-income countries, or take another approach to addressing this question.

You can use the box below to make notes in preparation for the discussion, if you wish.

*Provide your answer...*

Next you will look at the relationship between food and the cultural identity of people.

## 5.1 Food and culture

Food traditions play an important role in the culture and identity of people, and are often strongly connected with a regional or national sense of identity (Ichijo and Ranta, 2016). They are also part of cultural heritage and are fiercely protected, such as through indications and designations of the geographical origins of food.

A geographical indication is a sign used on products that have a specific geographical origin and possess qualities or a reputation because of that origin. Roquefort cheese, for example, comes from a region in southwest France, and its production requires a specific recipe that is dependent on a particular breed of sheep that is fed in a pre-defined way, according to local tradition. The cheese itself is aged in the caves in this region, giving it a unique flavour. Geographical indication is thus closely tied to the cultural traditions of a place.



**Figure 5** Roquefort cheese comes from a region in southwest France, and its production requires a specific recipe that is dependent on a specific breed of sheep that is fed in a specific way according to local tradition

According to the World Intellectual Property Organization (WIPO), a geographical indicator (GI) usually 'consists of the name of the place of origin of the goods', although 'non-geographical names or symbols commonly associated with a place can constitute a GI'. However, 'whether a sign functions as a GI is a matter of national law and consumer perception' (WIPO, 2017, p. 9). Their guidance continues:

in order to work as a GI, a sign must identify a product as originating in a given place. In addition, the qualities or reputation of the product should be essentially due to the place of origin. Since the qualities depend on the geographical place of production, there is a link between the product and its original place of production.

(WIPO, 2017, p. 9)

- Identify three other products you have come across that have geographical indication.
- There are a great number of examples to choose from, but you might have thought of Champagne (from northeast France), Darjeeling tea (from northeast India), Jamaica Blue Mountain coffee and Cornish pasties.

Next you will look at some unconventional sources of food and explore how they might contribute to environmental sustainability.



## 6 Unconventional food

You will now turn your attention to your diet in relation to environmental sustainability. Incorporating local wild plants in diet not only helps to diversify the dinner plate, but also promotes environmental sustainability by reducing the reliance on commercially grown vegetables and connecting people to nature.

Edible wild plants are common in farmland or in urban parks or even in backyards. These plants often grow on field margins, in hedgerows, or in small woodlands on farmland. They can supplement food and nutrition needs and also provide seasonal alternatives in 'lean' months before the annual harvest, particularly in low-income countries where farming is dependent on rainfall and influenced by the seasons. In many low-income countries where people are still dependent on edible wild plants for their food, it is important that farmland also supports this type of biodiversity.

A study by Shumsky et al. (2014), carried out in two villages in semi-arid parts of rural eastern Kenya, showed that edible wild plants form an important source of food and nutrition to households that have lower asset levels, lack off-farm income, and report food insecurity. Edible wild plants, however, are also common in the UK countryside.

In the following activity, you will use the field guide for edible wild plants in the UK to prepare a list of plants that you can find locally and think about how these plants might help you to diversify your dinner plate.

### Activity 7 Edible wild plants in the UK

Allow around 30 minutes.

Below is a link to the guide to edible wild plants in the UK. Which of these plants can be found near where you live? If you are a non-UK resident, you may want to use a guide to edible wild plants local to you, although you may come across some of your local plants from the UK guide.

[Wild Food UK: Identifying edible and poisonous wild plants](#)

It is likely that you will also need to do some research about what species grow close to where you live, or spend a few minutes observing the area immediately around you. Within the UK, records of where different species have been observed can be found via the website of the [Online Atlas of the British and Irish Flora](#), and in the [interactive plant distribution map](#) provided on the website of the Botanical Society of Britain & Ireland. The [National Biodiversity Network Atlas](#) may also be useful, likewise searches relating to local foraging activities.

*Provide your answer...*

### Answer

You may have found that there are a large number of edible wild plants within a short distance of where you live. It is likely that you were already aware of the presence of some of these – for example, *Taraxacum officinale*, the common dandelion (Figure 8), which can be found in urban gardens or in the countryside. Other species might be new to you, both in terms of the fact that they can be eaten or that they are growing in your local area.

Many of these plants can be used to add a bit of variety to your everyday dinner plate. For example, dandelion leaves can be quite bitter, but if you cover the dandelion plant with an upturned flowerpot, the leaves will turn a pale yellow–white colour as they become less potent, and will then make a nice salad. With a growing public interest in foraging for food in recent years, various websites and books have emerged that offer recipes involving wild plants and fruits.



**Figure 6** The leaves of dandelion (*Taraxacum officinale*), an humble weed in British gardens, can be used as salad if their bitterness is managed by covering the growing plant with upturned clay pot

It is important to note, though, that much care must be taken when selecting wild plants to eat. Non-edible species may look quite similar to others that can be eaten, and it is possible for edible species to become contaminated by pollution or pesticides in their immediate environment. Ultimately, as stated in the guide provided above, you should 'never consume a wild plant unless you are absolutely certain of its identification and its safety for consumption' (Harrison, 2008, p. 5).

Likewise, some plant species may be in scarce supply, or are protected by law. It is an offense to deliberately pick, collect or destroy protected species. It is also illegal to trespass on privately owned land, which may be where some edible species are found.

Next you will examine what 'frontier food' is and ask whether future food sustainability might need to be open to these radical alternatives.

## 6.1 Frontier food

Many plant and animal species that are able to live alongside humans are non-native and have been introduced from other parts of the world. Some of these have become invasive. For example, the grey squirrel (*Sciurus carolinensis*) is commonly spotted in UK gardens, but it is a non-native invasive species that has displaced the native red squirrel (*Sciurus vulgaris*). Similarly, Japanese knotweed (*Fallopia japonica*), an ornamental garden plant, has also become invasive, triggering legal measures for its control in the UK.

The spread of invasive species in urban or semi-urban areas has generally prompted measures to control or eradicate these species. However, some have seen them as an opportunity to diversify the sources of food whilst helping native species (e.g. *Eat the Invaders*, 2017). Such initiatives are often concerned about the increasing environmental costs of growing conventional staple crops to feed the world's population. As a response, many experiments in making use of unconventional sources of food have begun. Algae, fungi, insects, invasive species and weeds are some of these unconventional food sources. Can these sources help achieve food sustainability and also help meet the goal of feeding 9 billion people by 2050? In the following activity, you will explore the opportunities and challenges presented by this so-called 'frontier food'.

### Activity 8 Frontier food: a radical alternative to food sustainability?

Allow around 30 minutes.

Many invasive species can be suitable as food and are found in high abundance in the landscapes they have invaded. The following websites contain information about some non-native edible species.

- [Eat the Invaders](#) provides a list of invasive species in the US, and related recipes.
- The [GB Non-Native Species Secretariat](#) provides a list of invasive species in the UK.

Use these sources – plus any others that you are aware of – and answer the questions below.

1. Which non-native invasive species from the [Eat the Invaders](#) website can you access near where you live? (Bear in mind that species native to Scotland are not necessarily native in England, for example).

2. Which recipes of invasive species from the [Eat the Invaders](#) website would you be prepared to include in your diet?
3. What are the barriers to eating some invasive species?

*Provide your answer...*

#### Answer

One barrier to eating invasive species is our perceptions of what 'is' food, and what is not. These perceptions are often very difficult to change, but introducing 'invasive gourmet cuisine' may help to shift them.

An organisation called [Crayfish Bob](#) provides an interesting UK-based example. According to their website, to improve the environment they harvest and cook North American crayfish invasive in the UK waterways, and serve them at pop-up events and festivals. If similar efforts are made to discover recipes for other invasive species, collectively, such efforts can contribute to food sustainability in the long run.

## Conclusion

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The foods that people around the world eat is hugely diverse and in this free course, *Eating for the environment*, you began by looking at a range of different dietary choices and preferences. You then examined your own dietary choices and preferences and whether or not they incorporate the diversity of edible species on the taxonomic tree. You also looked at the links between food, culture and traditions, as well as the intellectual property rights over foods that have certain specific geographical origins. Finally you explored some unconventional sources of food including wild edible plants and non-native invasive species.

Even though the discourses of global food security are framed around feeding 9 billion people by 2050, there is more to food than just growing populations, high yields, and increased production. Food is about dietary choices and preferences, it is about culture and traditions, and it is also about environmental sustainability.

The dependence of the global food system on high-yielding agriculture and ever-more production does not always deliver environmental sustainability because there are unintended consequences of high-yielding agriculture, such as greenhouse gas emissions, pollution from agrochemical runoff, or loss of habitat for many species.

Unconventional sources of food prompt you to think about innovative ways of reducing the environmental footprint of what you eat. Eating for environmental sustainability will need us to explore these alternative sources of food and incorporate them in diets.

This OpenLearn course is an adapted extract from the Open University course [SDT306 Environment: responding to change](#).

## References

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Development Initiatives (2017) *Global Nutrition Report 2017: Nourishing the SDGs*

[Online]. Bristol, UK, Development Initiatives. Available at

[https://www.globalnutritionreport.org/files/2017/11/Report\\_2017.pdf](https://www.globalnutritionreport.org/files/2017/11/Report_2017.pdf) (Accessed 7 November 2017).

Eat the Invaders (2017) *Fighting invasive species, one bite at a time* [Online]. Available at

<http://eattheinvaders.org/> (Accessed 17 November 2017).

FAO (1999) 'Background Paper 1: Agricultural Biodiversity', *FAO/Netherlands Conference on the Multifunctional Character of Agriculture and Land*, Maastricht, The Netherlands, FAO. Available at

[http://www.fao.org/mfcal/pdf/bp\\_1\\_agb.pdf](http://www.fao.org/mfcal/pdf/bp_1_agb.pdf) (Accessed 5 September 2017).

FAO, IFAD, UNICEF, WFP and WHO (2017) *The State of Food Security and Nutrition in the World 2017. Building resilience for peace and food security* [Online], Rome, FAO.

Available at <http://www.fao.org/3/a-i7695e.pdf> (Accessed 6 November 2017).

Godfray, H. C., Beddington, J. R., Crute, I. R., Haddard, L., Lawrence, D., Muir, J. F.,

Pretty, J., Robinson, S., Thomas, S. M. and Toulmin, C. (2010) 'Food Security: The challenge of feeding 9 billion people', *Science*, vol. 327, pp. 812–818 [Online]. Available at

<http://science.sciencemag.org/content/327/5967/812.full> (Accessed 6 December 2017).



- Harrison, M. (2008) *Pocket Urban Foraging Guide*, Wild Food School [Online]. Available at [www.wildfoodschool.co.uk/urban/wfsurbanguide.pdf](http://www.wildfoodschool.co.uk/urban/wfsurbanguide.pdf) (Accessed 13 March 2019).
- Ichijo, A. and Ranta, R. (2016) *Food, National Identity and Nationalism: From Everyday to Global Politics*, Basingstoke, Palgrave Macmillan.
- McCouch, S., Baute, G. J., Bradeen, J., Bramel, P., Bretting, P. K., Buckler, E., Burke, J. M., Charest, D., Cloutier, S., Cole, G., Dempewolf, H., Dingkuhn, M., Feuillet, C., Gepts, P., Grattapaglia, D., Guarino, L., Jackson, S., Knapp, S., Langridge, P., Lawton-Rauh, A., Lijua, Q., Lusty, C., Michael, T., Myles, S., Naito, K., Nelson, R. L., Pontarollo, R., Richards, C. M., Rieseberg, L., Ross-Ibarra, J., Rounsley, S., Hamilton, R. S., Schurr, U., Stein, N., Toll, J., Tomooka, N., Valls, J., van der Knaap, E., van Tassel, D., Varshney, R. K., Ward, J., Waugh, R., Wenzl, P. and Zamir, D. (2013) 'Agriculture: Feeding the future', *Nature*, vol. 499, no. 7456, pp. 23–24.
- Mintz, S. W. and Du Bois, C. M. (2002) 'The Anthropology of Food and Eating', *Annual Review of Anthropology*, vol. 31, pp. 99–119.
- Mora, C., Tittensor, D. P., Adl, S., Simpson, A. G. and Worm, B. (2011) 'How many species are there on Earth and in the ocean?', *PLoS Biology*, vol. 9, no. 8, p. e1001127 [Online]. DOI: 10.1371/journal.pbio.1001127 (Accessed 5 September 2018).
- National Geographic (n.d.) *The future of food* [Online]. Available at [www.nationalgeographic.com/environment/future-of-food/](http://www.nationalgeographic.com/environment/future-of-food/) (Accessed 6 February 2019).
- Núñez, M. A., Kuebbing, S., Dimarco, R. D. and Simberloff, D. (2012) 'Invasive Species: to eat or not to eat, that is the question', *Conservation Letters*, vol. 5, pp. 334–41 [Online]. DOI:10.1111/j.1755-263X.2012.00250.x (Accessed 7 December 2017).
- Shumsky, S. A., Hickey, G. M., Pelletier, B. and Johns, T. (2014) 'Understanding the contribution of wild edible plants to rural social-ecological resilience in semi-arid Kenya', *Ecology and Society*, vol. 19, no. 4, p. 34. Available at <http://dx.doi.org/10.5751/ES-06924-190434> (Accessed 7 December 2017).
- WHO (2017) *The double burden of malnutrition. Policy brief* [Online], Geneva, World Health Organization. Available at <http://apps.who.int/iris/bitstream/10665/255413/1/WHO-NMH-NHD-17.3-eng.pdf?ua=1> (Accessed 5 September 2017).
- WIPO (2004) *World Intellectual Property Organisation Intellectual Property Handbook* [Online], Geneva, WIPO. Available at [http://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo\\_pub\\_489.pdf](http://www.wipo.int/edocs/pubdocs/en/intproperty/489/wipo_pub_489.pdf) (Accessed 7 November 2017).
- World Bank (2012) *Four Steps to Feeding the World in 2050* [Online]. Available at <http://www.worldbank.org/en/news/feature/2012/10/16/four-steps-feed-world-2050> (Accessed 6 November 2017).

## Acknowledgements

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