

Theme 6. Agriculture

Teacher guide - Ages 11-14

Preparation

Review the material and films beforehand. Do some preparation on the topic. Some materials are required for the outdoor experience. Feel free to add any resources or materials you have available to enrich the lessons. Also check the *Introduction lesson Teacher guide* for useful tips and suggestions for preparing and giving the lessons within a theme.

Learning goals

The students ...

- learn about the origin of food.
- learn about the different types of agriculture.
- know how agriculture affects the climate.
- learn about the nitrogen problem.
- know how you can reduce CO₂ emissions.
- know some examples of organic farming.
- know how they can choose organic products.
- know solutions of how to waste less food.
- learn what circular agriculture means.

Key vocabulary

- agriculture
- the environment
- food
- production
- crops
- animal husbandry
- arable farming
- (food)processing
- transportation
- renewable
- CO₂
- circular
- nitrogen
- pollution
- organic food
- fodder
- seasonal products



Introduction

[Slides 3 and 4]

Bring a few food items, for example fruit and something packaged (rice, vegetables). The students divide the food into two sections: from their own country and from abroad.

- Why do they think that?
- How can they find out where the food comes from? How do you determine where food comes from if it isn't in a package or is without a label?

After this, discuss the learning goals of this theme.

Instruction

Problem

[Slides 5-6]

Complete exercise 1.

What grows above ground (broccoli) and in the ground (potatoes, onions)? Can the students think of more examples?

Much of our food is produced by agriculture.

[Slides 7-10]

Then discuss the different types of agriculture.

Arable farming is the cultivation of land to grow crops for consumption. For example: potatoes, grain crops (barley, rice, wheat, peas and broad beans). In arable farming, farmers want to protect their crops from diseases and insects. Some farmers use pesticides to do this. These protect the crops, but are not good for the environment.

Horticulture is the growing or cultivation of vegetables, fruit, plants, flowers, trees, bulbs or seeds in order to consume them. In greenhouse horticulture, farmers grow the plants in a greenhouse. In a greenhouse, you can easily regulate the temperature, the amount of water and light. This uses a lot of energy (electricity).

Animal husbandry is having livestock so that eggs, milk and meat can be produced. Livestock includes: cows, sheep, pigs, goats, poultry (chickens). Having livestock means having manure. Manure is an important nutrient for the soil. But, too much manure is not good for the environment.

After discussing these forms of agriculture with the students, add: *There are more forms of agriculture, but they are not discussed in this lesson.*

Complete exercise 2.

[Slides 11 - 12]

Farmers produce food. They want to do this safely with care for the environment. But farmers can't do this alone. We ourselves have to make good (sustainable) choices when we buy a product.

Bio-industry: *The farmer has many animals on little land. Animals are given concentrated feed in order to grow faster. This is called bio-industry.*

Organic farming: *The farmer gives the animals a lot of freedom, they have a lot of room to live in. This is called organic farming.*



[Slides 13-15]

A lot of land and water is needed to grow food and fodder (food) to raise animals. Everything that happens in agriculture also requires a lot of energy (fuel and electricity).

Use the photos to discuss certain examples.

A lot of energy (fuel and electricity) is needed for all the things that happen in agriculture. Fossil fuels (e.g. natural gas, coal) are burned to supply this energy. A lot of CO₂ is released in this process.

[Slides 16-19]

Greenhouse gases, such as carbon dioxide (CO₂), ensure that part of the Sun's heat remains within the atmosphere. Without greenhouse gases it would be far too cold on Earth. But, there is a problem ...

Look at the picture.

Human beings are responsible for additional CO₂ emissions, which causes the Earth to warm up too much.

Complete exercise 3 and 4, then discuss as a class.

[Slides 20-24]

A lot of energy is needed for food production. Of all the food produced, meat and dairy produce the most greenhouse gases such as CO₂. Did you know that cows release gases like methane into the atmosphere?

Complete exercise 5.

The nitrogen problem.

About 78% of all the air around us is made up of nitrogen. Nitrogen is a gas that you cannot see or smell. Humans and animals need it. The problem is that nitrogen mixes with other substances. The problem is that nitrogen mixes with other substances, creating nitrous oxides and ammonia which are bad for the environment.

Exhaust fumes from cars, planes, factories and farm machines create nitrogen oxides. The manure from cows, for example, creates ammonia. Through precipitation or via plants, the harmful substances end up in the soil and groundwater.

Complete exercise 6.

[Slides 25-26]

Watch and discuss the film.

Complete exercise 7.

Growing too many of the same crops too often prevents the soil from restoring itself.

[Slides 27-30]

You now know that agriculture consumes a lot of energy and that cow manure and the use of chemicals cause air, water and soil pollution. But a lot of energy is also consumed in the steps following the cultivation of food produce.

Watch the film and complete exercise 8.

Transporting groceries home by car costs fuel, as does refrigeration, freezing and cooking.



[Slides 31]

We have talked about the climate, animal welfare and the environment. Because our world population is growing, we need more and more food. Also, we need to take care of the Earth. And yet, together, we waste so much food by throwing food away.

[Slides 32-35]

A solution

Thankfully, there are solutions to the problems in agriculture.

- *It is important to emit less CO₂ and other harmful gases.*
- *As well as better soil quality. So, for example, stop the pollution of soil with toxic substances.*
- *Also, be more economical with energy. Use renewable energy sources such as wind, hydro and solar energy instead of natural gas and coal.*
- *Treat animals better.*

[Slides 36-38]

Watch and discuss the film.

Complete exercise 9.

*By 2030, governments even want to move towards a form of **circular agriculture**: the nutrients that are extracted from the soil are returned to the soil. The animal's manure goes back to where the cattle feed grows. This completes the circle and we treat the soils better.*

[Slides 39 - 43]

What can you do?

Governments are taking measures to reduce the emission of CO₂ and nitrogen. But you can also do something, for example by keeping a watch on your own diet: everything you eat and drink has an impact on your health, but also on our planet.

Watch the film.

Complete exercises 10 and 11.

Soft drinks and snacks are not good for your health. On top of that, they are bad for the environment because of the process of being produced in a factory, packaged and transported. You can also make sure that you waste less food. So eat only what you need and throw away as little as possible.

Complete exercise 12. Examples to discuss:

- *Think first how hungry you are (don't take too much food)*
- *What can you make with old bread? (toasted sandwich, French toast)*
- *Leftover day*
- *Buy the B-choice articles in the shop (crooked cucumbers etc.)*

[Slides 44-45]

Most fruit and vegetables are harvested in a particular season. These are called seasonal products. They are less harmful to the environment because they can be transported quickly from the land to the shop. Or choose vegetables that are harvested or stored throughout the year. Things like beetroot, broccoli, red cabbage, onion and carrots.

Products produced in faraway countries are transported by plane, for example, and often need more packaging material (for extra protection). This is not good for the environment.



The same applies to vegetables cultivated in heated greenhouses. The greenhouses use a lot of energy. So, your choice does matter!

Suggested related themes

Theme 1 climate change deals with the consequences of too much CO₂ emissions.

Theme 8 about trees shows the problems caused by deforestation.

Theme 9 is about air touches upon the nitrogen problem.

Worksheet

[Slide 46]

Complete the worksheet and discuss the answers. If students worked together on an exercise, let them present their answers together.

Practical assignment

[Slide 47]

Create a collage about agriculture. You can use photos, drawings and text. Show what you know about the problems and the solutions to these problems.

Closing

[Slide 48]

Review the learning goals and agree with the students how and when they will work on their practical assignment.

Outdoor experience

[Slide 49]

Visit a farm or someone who has a kitchen garden in your area. Write down your questions beforehand. Take photos and write a short report about your visit. Share your report with family and friends.

The aim is for students to learn about a form of agriculture in practice. For example, a kitchen garden is a vegetable garden where vegetables are grown for one's own use. You can help the students with some example questions:

- What products are there? How do they grow? How are they cultivated?
- If there are animals: how do the animals live and how are they cared for?
- Are crops cultivated? Which crops? How are they cared for?

Extras

[Slides 50 - 60]

Hangman

Quiz

Extra films.



Materials Required

For the Practical Assignment: A4-paper (or larger), scissors, glue and colouring pencils, as well as magazines, books, image resources.

You could show examples of vegetables and fruit that do not meet the requirements in terms of form, shape or colour.

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Answer key - Ages 11-14

Exercise 1

Read the following sentence:

"A healthy climate starts on your plate."

What does this sentence mean?

Possible answer:

If you watch what you eat and drink you help the climate, by, for example, not wasting food, eating less meat, dairy, snacks and soft drinks.

Exercise 2

You have learnt about animal husbandry, arable farming and horticultural farming. Do you know of any other forms of agriculture? Use the internet to help you.

What examples did you find? Share what you have learned with a classmate.

Possible answers:

- fish farming
- forestry/agroforestry
- fruit farming

Exercise 5

a. How do you know if a product is organic or not? Use the internet to find examples.

Organic products are not sprayed with chemicals and no artificial fertiliser is used to make the crops grow faster. Organic products, for example in Europe, have a special quality mark or label:

