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Food Carbon Footprint



Theme: **Sustainable Food Production**

Total duration: 7 hours

School subjects involved
(suggestion): Science,
Technology, Maths, Civic
education, other.

Equipment/materials:

Computer and Internet
connection and in
alternative mobile phones
for installing an App and
QR code scanner

Worksheets: 1 attached to this
document

PPT: [Food Carbon Footprint - in
class-guide for the teacher](#)

Digital tools: PC, IWB, Apps for
Carbon Footprint calculation

Brief description

This Learning Unit aims to assess the impact of any food on the environment using calculators to measure the carbon dioxide emissions produced during the production of such food and its ingredients.

*The **carbon footprint** is the total amount of greenhouse gas in terms of carbon dioxide emission that is generated to produce a certain produce (including other greenhouse gases (GHG) expressed as CO₂ equivalent) by the production methods (e.g., agriculture, machineries, use of external inputs), the transportation (e.g., distance and fuel need to move the produce or its parts) and the transformation.*

The Carbon Footprint calculators provide the amount of CO₂ per kilo of product (it is usually indicative, as the amount substantially varies with the typology of production and all following processes).

Despite these limitations, the Carbon Footprint is a way to immediately get aware about the environmental impact of food and reflect on how our choices could be more sustainable





The teacher can use the PPT presentation

https://docs.google.com/presentation/d/1J5yjuNyLmU_Ljv1PQ28G_fKwpNFLa4Q/edit?usp=drive_link&ouid=112965038542677162463&rtpof=true&sd=true as guide in the classroom for the implementation of the Learning Unit.

Learning Objectives

In this Learning Unit students will make a hypothesis on the likely environmental impacts connected to the ingredients of a food recipe or meal and make the investigation to verify the hypothesis. They will make bibliographical research on the general impacts of food productions and will use automatic calculators for the calculation of the food carbon footprint.

Students will learn about:

- ✓ Carbon Footprint
- ✓ Sources of pollution in the food chain
- ✓ Agriculture as source of Greenhouse Gases and connection to climate change
- ✓ Conventional vs. sustainable production methods
- ✓ Food supply chain and distance of production (means of transportation)

Students will be in a position to:

- ✓ Understand the factors impacting the environment due to food choices
- ✓ Choose a specific ingredient based on the carbon footprint
- ✓ Work in group



Steps of the Learning Unit

Orientation

Duration: 10 minutes

School subjects: Science, Civic education, Technology, other.

Where the activity takes place: In the classroom.

Method (how the students have to work): Brainstorming as a class.

Equipment / materials: No need for specific materials, in alternative the IWB and internet for a video projection.

Description:

This Step encourages stimulate the students' existing knowledge and critical thinking on the reasons why food is a source of greenhouse gas and the impacts of own habits.

The teacher can take inspiration from the first slides of the suggested presentation (see above) which brainstorm students by informing them about the *"hidden" carbon dioxide in a food* (e.g. 0,6 kg of carbon dioxide are released to produce a cup of milk). *What does it mean? How is this number generated?"* or in alternative, the teacher can show the short video on cows' GHG production (about 2 minutes): <https://www.bbc.com/news/av-embeds/49238749/vpid/p06t0hfx>

Then, the teacher should ask students more specifically about own food, *if they have ever thought about the environmental impact of own meal*, to proceed to the conceptualisation phase.

Conceptualisation

Duration: 20 minutes

School subjects: Science, Civic education, Technology, other.

Where the activity takes place: In the classroom.

Method (how the students have to work): Brainstorming as a class.

Equipment / materials: Worksheet – Part 1.

Description:

Conceptualization aims at formulating a hypothesis or questions regarding the environmental impacts of the recipes (dish or meal) chosen for the project and that will be explored through the investigation.



Following the Orientation phase, students make their own hypothesis on the types of pollution generated by the production of its ingredients and its production (e.g. use of fertilizers, pesticides, machineries, transportation etc.) (Worksheet – Part 1 or slide 6 of the PPT).

Then, the teacher brainstorms the students about *methods for quantifying the “environmental impact” of a produce*, in order to compare it with other produces.

After brainstorming, the teacher introduces the concept of *Carbon Footprint* and the Apps that can be used to calculate the food carbon footprint. The following phase will make use of the Apps for the calculation of the carbon footprint of a specific recipe.

The activity should be inclusive and encourage the participation in the brainstorming of all students. Make sure not to assume any knowledge of scientific terminology when posing questions.

Investigation

Duration: 2 classes of 45 minutes

School subjects: Science, Technology, other.

Where the activity takes place: In the classroom and homework.

Method (how the students have to work): Students work in groups.

Equipment / materials: List of ingredients of the dish/meal and relative recipes, Carbon Footprint Calculator

Description:

This Step aims at carrying out all necessary activities to answer the questions formulated in the Conceptualisation. Investigation involves 3 stages, Planning, Investigation and Analysis. Students work in teams, and each team analyses one (or more) ingredient(s).

1) Planning

Location: In the classroom

Time: 30 minutes

Materials: Notes and pen

Description:

In classroom, students working in group:

- search for the recipe(s) to know the amount of each ingredient,
- one (or more) ingredient is assigned to each group,
- make bibliographical research on the internet or interview producers about the environmental impact of the ingredient (in general terms or directly connected to the



used produce by scanning any QR code on the label). They should find information about the production and resources needed for the production, the environmental issues connected to production, main production country and type of transportation for trade.

- Choose the App for the Carbon Footprint calculation such as the following:
 - “My Emissions” <https://myemissions.green/food-carbon-footprint-calculator/> automatically calculates it on the basis of the dose of the ingredient (e.g., grams). The database is pretty rich. It provides also some comparisons in terms of transport or food consumption, to better understand the meaning of the CF.
 - “Zero Foodprint calculator” <https://dazzling-inferno-125.firebaseio.com/#> automatically calculates CF and allows also to set up the distance of the production site and provides the equivalent to the emissions of driving and the cost to offset it.
 - “INRA Database” <https://doc.agribalyse.fr/documentation-en/agribalyse-data/data-access> has two databases, one based on [conventional productions](#) and one for [organic productions](#), so that comparisons are allowed.

2) Performing

Location: In the classroom and homework

Time: 30 minutes class

Equipment / Materials: Mobile phones, computer and internet, Worksheet – Part 2

Digital tools: App for Carbon Footprint assessment (CO₂ eq/kg)

Description:

- Students use the App for a Carbon Footprint calculation of the ingredient on the basis of the weight and also note the Carbon Footprint per kilo or 100 g of produce in order to compare the different ingredients)
- Students make bibliographical research/interviewing the producer on the ingredient about the way it is produced (needed resources, main production country, environmental issues connected to the production)

3) Analysis / Findings

Location: Homework

Time: 45 minutes

Equipment / Materials: Computer, Worksheet - Part 2

Digital tools: PowerPoint or similar software

Description:

- Students gather values of the Carbon Footprint of the ingredient.



- Students prepare a slide or a text about what they have learnt about the production and the environmental impacts relative to the ingredient;

Conclusion

Duration: 1 class of 45 minutes

School subjects: Science, Technology, other.

Where the activity takes place: In the classroom.

Method (how the students have to work): As a class.

Equipment / materials: Worksheet – Part 3

Description:

Students gather the results from each group in one table and brainstorm on the:

- Most polluting ingredient per kilo of produce in the recipe
- Total carbon footprint of the recipe and comparison to the pollution generated by x driven kilometres (see App like “My emissions”)
- Environmental impacts of the recipe from bibliographical research
-

Discussion

Duration: 1 class of 45 minutes

School subjects: Science, Technology, other.

Where the activity takes place: In the classroom.

Method (how the students have to work): As a class and group work

Equipment / materials: Computer

Description:

In the classroom, the teacher brainstorms the students to reflect on

- What ingredient(s) (or type of production) should be replaced to reduce the environmental impact of the recipe, based on what criteria of sustainability:
 - Production method (e.g., preferring produces from integrated agriculture, organic agriculture, sustainable agriculture)
 - Distance of production and preparation (e.g., preferring products produced locally, sold in the local market),
 - Type of ingredient (e.g., changing one ingredient with other one less impacting)
- To verify the effective improvement in sustainability, students should try to recalculate the new Carbon Footprint of the meal.



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- Students write down the new recipe with the alternative ingredients that will be published in the final “Recipe Book”.

Resources:

Impacts of food on climate and environment:

How does the food we eat impact our climate?

<https://www.youtube.com/watch?v=ExNpnukxB2Q&feature=youtu.be>

Why do we need to change our food system? <https://www.youtube.com/watch?v=VcL3BQeteCc>

Production methods:

FAO Multimedia: <https://www.fao.org/sustainability/resources/multimedia/en/>

Circular Food Systems - The initiatives and technologies leading a food revolution

<https://www.youtube.com/watch?v=71M0b5cFhlk&feature=youtu.be>

SOFA 2022 - Leveraging automation in agriculture for transforming agrifood systems

https://www.youtube.com/watch?v=iZC-kWKPY_M

Agroecology for Sustainable Food Systems <https://youtu.be/OgJlnRNyEDY>



Worksheet on Food Carbon Footprint

This activity will help you to answer the two following questions regarding the meal that you have chosen to investigate in the GOODFOOD project:

- “What is the environmental impact of your chosen dish/meal?”

Part 1. Conceptualization.

Date: _____

Group work (students' names):

What is your ingredient? _____

Exercise 1. Based on your experience or hypothesis, connect with an arrow the factors connected to intensive productions to the type of pollution relatively to your ingredient.

Production	Environmental impact
Use of fertilizers	CO ₂ emissions
Use of pesticides	CH ₄ emissions
Soil tillage	Nitrogen leakages
Cattle farming	Water pollution
Rice production	Biodiversity loss
Use of machineries	Water shortages
Overfishing	Microplastic
Greenhouse production	Toxicological effects
Plastic mulching	Particulate
Distance	Land use change
	Mineral resources exploitation
	Energy use
	Water use

Explain why:

Part 2. Investigation.

Date: _____

Group work (students' names):

What is your ingredient? _____

Exercise 1. How much CO₂ is hidden in the food? Calculate the food Carbon Footprint for the ingredient.

Carbon Footprint is a method to easily understand the level of pollution generated by a produce (but also behavior, life style etc.). It represents the total Carbon Dioxide that has been released in the production phase and it is expressed as CO₂ equivalents (as other greenhouse gases are released in the production process and the corresponding CO₂ is given on the basis of their global warming potential. In some cases, the produce's value may include following phases such as transportation. Use the App such as "My emission" to know the CO₂ equivalent for specific produces and calculate the CF of the ingredient as well as the whole meal.

Add to the table as many rows as needed.

Ingredient	Grams of ingredient in the recipe	CO ₂ equivalent per gram	CO ₂ equivalent in the recipe Column 2 * Column 3	Corresponding CO ₂ emitted by driving kilometers

Exercise 2. What type of environmental impact is connected to the ingredient's production?

Make bibliographical research on the production method of the ingredient and report the type of environmental impact and pollution connected to such a method.

Add to the table as many rows as needed.

Ingredient	Production method	Type of environmental impact



Part 3. Conclusion.

Date: _____

Class work.

Exercise. How much is the environmental impact of your recipe?

Report in the table the values and results found in the previous activities.

Add to the table as many rows as needed.

Ingredient	CO ₂ equivalent per gram	CO ₂ equivalent in the recipe	Type of environmental impact

What is the most polluting ingredient per gram of produce in your recipe?

What is the total Carbon Footprint of your recipe?

How many kilometers by driving it correspond to (see App like “My emissions”)?

From bibliographical research, what types of impact does your recipe generate on the environment?



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Part 4. Discussion.

Date: _____

Class work.

Exercise 1. How would you make your recipe less impacting?

What ingredient(s) would you replace in your recipe? Why? (e.g., because of the Carbon footprint, doses in the recipe, method of production, distance of production).

Suggested alternative ingredient: _____

Re-calculate the Carbon Footprint of the new recipe. If you decide to change the production method, you can find a value of CO₂ equivalent per kilo of produce in the database of organic productions developed by INRA-France and available in the resources of the Learning unit.
