**Foodprints**

**Understanding Connections Between Food Choices and the Environment**

**Session 2: Carbon Footprints of Foods**

 **Class Plan**

**Introductions** (10 min)

 Introduce your neighbor.

**Slides/Discussion**

**Learning outcomes:**

After this class you will be able to:

* Understand the reasons why certain food products have a higher carbonthan others
* Describe the natural C cycle and why fossil fuel combustion adds to C to the cycle.
* Describe the major greenhouse gases
* Calculate the CF of a simple meal
1. **Recap of planetary boundaries concept**

**Brainstorm/Discuss: Thoughts on the PB paper. Do you find it a helpful concept? Are there other boundaries you would add?**

1. **Climate Change Background**

Greenhouse effect:

Plots of GHG over last couple of centuries.

Temperature of Earth

CNN article showing warming

**Brainstorm: Why do people have a hard time “believing” in climate change?**

1. **Carbon Footprints of foods**

CF of food graphs

**Brainstorm: Why is the CF for some foods higher than that for others?**

**Main Point #1: Animal foods generally have high footprints.**

**Brainstorm on why.**

Show slide illustrating that if foods are eaten directly, fewer crops overall are needed than if feed crops are grown for animals. Only a small fraction of the energy in the feed crops becomes energy we eat.

**Main Point #2: Products from ruminants have a higher footprint than other animal products**.

Show slide with cow producing methane and discuss.

1. **Recipe calculations**

**Show veggie burrito and beef burrito infographics.**

Point out low carbon footprint of beans, discuss nitrogen fixation capabilities of bacteria that live in the rhizosphere of legumes.

Show some other examples of carbon footprints of foods.

**Active learning: Sandwich calculation by hand. (10 min)**

 **See handout below.**

 Students can work through making two different sandwiches using the per serving carbon footprint numbers. They can calculate a carbon footprint for a “comfort food”—something they might enjoy if they weren’t considering carbon footprint at all. The second sandwich should be something they would enjoy if they were trying to have a low carbon footprint.

**Putting carbon footprint numbers in context**

During the report out from the sandwich activity, it will be clear that the difference between a typical high and low CF sandwich is around 3,000 g CO2-eq. Discuss that we can so far understand the relative difference between two foods, but we don’t know how to conceptualize whether these numbers are significant, b/c we are not used to thinking in terms of CO2-eq. Show slide giving the target carbon dioxide equivalent reduction for the entire country per year. The target for the US is 447 million metric tonnes per year. This sounds like a big number, and it is, but if we divide that number by the population of the US and the number of days in a year, we come up with 3,660 g CO2-eq per day, which is similar to the difference between two sandwiches!

**Homework: What might a lower carbon footprint look like in your dining hall or favorite hall?**

**What is the carbon footprint of sandwiches??**

Here is some information about the carbon footprint of a bunch of sandwich ingredients. For each row, the first number (middle column) comes from a review scientific papers on the carbon footprint of foods by Heller and Keoleian (2014). The column on the right takes into account the size of servings so the numbers are more convenient to use.

|  |  |  |
| --- | --- | --- |
| **Food** | **g CO2/g food**  | **g CO2 / serving**  |
| 1 bagel (98g)  | 0.42 | 41 |
| 1 Slice of Bread (50g)  | 0.42 | 21 |
| Hummus (15g = 1 tbsp) | 1.3 | 20 |
| 1 Slice of Cheese (28.35g)\* | 9.78 | 277 |
| 1 Slice of Ham (28.35g) \* | 6.87 | 195 |
| 1 Slice of Roast Beef (28.35g)\* | 26.45 | 750 |
| 1 Slice of Chicken/Turkey (28.35g)\* | 5.06 | 143 |
| 1 Slice of Tomato (20.5 g) | 0.3 | 6 |
| 1 Piece of Lettuce (9g) | 1.03 | 9 |
| Peanut butter (16g = 1 tbsp) | 1.94 | 31 |
| Jelly (20 g = 1 T) | 0.35 | 27 |
| Hamburger patty | 26.45 | 2,645 |
| Black bean patty | 0.78 | 78 |

* Note: a deck of cards size of meat = 3 ounces = 3 slices

Let’s design two sandwiches—one with a high carbon footprint and one w a lower one.

|  |  |  |  |
| --- | --- | --- | --- |
| Food  | # of servings | Carbon Footprint per serving | Carbon footprint contribution  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Total | = |

|  |  |  |  |
| --- | --- | --- | --- |
| Food  | # of servings | Carbon Footprint per serving | Carbon footprint contribution  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
|  |  |  |  |
| Total | = |

**Optional: Alternative to Sandwich Handout: Sandwich Carbon Footprint Graphing with Excel**

Separate word document will guide the students through the in class exercise. They will download and use an Excel sheet to make stacked column graphs showing ingredient breakdown for the CF of various sandwiches. Students can use the recipes given in the Espinoza paper to make two meat sandwiches and two vegetarian sandwiches. They can add two additional plant based ingredients using the data in the handout/Excel sheet. The resulting graph will have six columns, one for each sandwich, that show the total CF of the sandwich as well as the CF’s of the various ingredients.

The in class exercise sheet also includes some transport calculations, but that type of calculation can be saved for the guacamole discussion.

**Optional Active learning: Guacamole demonstration**

While showing the slides, you will be asking the students to imagine they want to bring guacamole to an event. Discuss how major ingredients in guacamole are available in bins (non-refrigerated) at the store.

Have ingredients handy to show: (all but cilantro would be unrefrigerated)

* Avocados
* Lime
* Garlic
* Red onion or shallot
* Salt
* Tomato (optional)
* Cilantro (optional)

You can show the slide giving the ingredient by ingredient carbon footprint breakdown. If you preferred, you can do back of the envelope carbon footprint calculation of the ingredients, by having students give carbon footprints of major ingredients from the Heller and Keoleian database. Either way, the students will see that the total is about 600 g CO2-eq for a large bowl.

This table gives transit carbon costs for different types of transportation and temperatures. Grams of CO2e per pallet per km are given below:

|  |  |  |  |
| --- | --- | --- | --- |
|  | Ambient | Chilled | Frozen |
| Med. rigid truck | 88 | 106 | 112 |
| Lg. rigid truck | 85 | 102 | 108 |
| City articul. | 56 | 69 | 73 |
| 32 T artic. | 51 | 61 | 65 |
| 38 T artic. | 48 | 58 | 61 |

Data Source: Tassou, S.A., De-Lille, G., and Ge, Y.T. (2009) Food transport refrigeration – Approaches to reduce energy consumption and environmental impacts of road transport.

While you are going through these slides, you can make the guacamole while a student changes slides for you.