Lesson Title: Food Miles: Understanding the Distance Food Typically Travels in the U.S.

Time: 40 minutes + 15 minutes prep time

Materials:
Two red tomatoes
Steps of food system cards
Food cards (local and imported)
Food Miles worksheet
Tomatoes to taste test (local and store-bought)

Standards:
S7.A.1.2: Identify and explain the impacts of applying scientific, environmental, or technological knowledge to address solutions to practical problems.
S7.A.1.2.1: Describe the positive and negative effects (both intended and unintended) of scientific results or technological developments.
S7.A.3.1.2: Explain the concept of order in a system (e.g., first to last manufacturing steps; trophic levels; simple to complex—levels of biological organization from cell to organism).

Objectives:
1. To introduce the idea that much of our food travels long distances from farm to plate
2. To compare and contrast a global and local food system and explore the pros and cons of each system
3. To explore where our food comes from
4. To give students an understanding of how their choices have a global and environmental impact

Vocabulary:
Fossil fuels: *a combustible organic material such as oil, coal or natural gas*
Greenhouse gases: *gases such as carbon dioxide, methane and ozone that act as a shield that traps heat in the earth's atmosphere*
Climate Change: *a long-term change in the earth's climate/weather patterns, including changes in temperature, wind patterns and rainfall (effects include: rise in sea level, melting glaciers, increases in intensity of extreme weather events such as drought or hurricanes)*
Food miles: *the distance food travels from farm (where it is produced) to plate (the consumer)*

Opening/Overview:
Part I: The Traveling Tomato Game
In this activity, the class will enact two short skits of a tomato's journey through the global food system. During the first skit, students will follow the steps of a tomato grown in Mexico. In the second, the skit will follow a tomato grown locally in Pennsylvania.

Part II: Where in the world does our food come from?

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This activity will demonstrate to students that a large portion of the produce in grocery stores comes from far away. Students will map where certain items come from, and calculate the distance they traveled to Pennsylvania and how much pollution was emitted during the journey.

The Plan/Procedure/Lesson Activities:

Part I: The Traveling Tomato Game

Global Food System

1. Tell students we will be tracing the journey of a tomato bought from the grocery store and you will need a volunteer. Call up on person, hand them the farmer card and tomato, and explain the tomato starts here: at the farm. Then, call up another volunteer, give them the processing card, and the tomato, and explain it goes here next.
2. Then, pass the tomato along through the "transporters"--there should be 4). Each transporter should say how many miles the tomato is traveling, with **500 miles** per transporter. Mexico is about 2,000 miles from Meadville, so our tomato has to travel all that way.
3. After the transportation, the tomato should go to a distribution person, then a grocery store, and finally to the plate of the person eating it.

Local Food System

1. Pass the tomato again, this time start with a 'Local Farmer,' who reads their card, then 'Consumer' who reads their script. To make the example even more extreme, think about the MARC garden. Ask students how far they think the garden is from their school (0.1 miles)? If we grow a tomato there and eat it at our school, it only traveled 0.1 miles!

Wrap up:

- What could we call the first food system? *Global*
- The second system? *Local food system*
- Which do you think is healthier for the environment?
- Create a pro/con list for each system on the board.

Part II: Where in the world does our food come from?

So we can see that transporting food long distances guzzles fossil fuels and emits greenhouse gases that contribute to climate change. Do the math to figure out how many greenhouse gas emissions are produced as your food travels from farm to your plate.

1. Divide the class into groups of 4-5. Give each group a set of food cards (which have both local and imported versions of the food), and a worksheet to fill out.
2. Briefly explain the worksheet: students should start by reading through their food cards. On each card, it will have the number of miles traveled by that item AND the way by which it traveled (plane, train, etc). They will use all this information to calculate the GHG emissions of that item.

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Calculation: Use the food miles calculator to calculate to total food miles it took to deliver to produce to Pennsylvania.
3. Refer to the table and compare the emissions/pollution created by food from abroad.
4. Students should figure out which of their products are available locally in Pennsylvania, and get on the “PA Preferred” website to see where they might be available.

Wrap-up:

- How can you find out what foods are local in PA/where they are grown in PA?
- What can we do in winter to eat local foods?
- What does it mean to eat seasonally?
- Do foods taste different when they are “in-season?”

For worksheet:

Steps to calculate the environmental impact of your food miles:
Step 1: Check the label—where did it come from?
Step 2: Look it up on the chart—how many miles did your food travel from its origin to your school
Step 3: Which method of transportation did your food use to get here? Plane, boat, train, truck?
Step 4: Now you are ready to do the calculations. Miles traveled multiplied by ghg emissions (see table below).

Grams of GHG emissions per kilometer traveled for each pound of food:

PLANE = 1.1010
BOAT = 0.1303
TRAIN = 0.0212
TRUCK = 0.2699

For example:
A pound of tomatoes from Mexico travels ~2274 miles to reach Maine. Since it travels by truck we multiply the distance traveled by 0.2699.

2274 m x 0.2699 = 613.75 kilograms of GHG emissions

That means that 613.75 kg of GHGs are emitted into the atmosphere.

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Materials for lesson: Steps in the Food System Cards

Farmer

Processor

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Food Distributor

Transportation

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Transportation

Grocery Store

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Transportation

Transportation

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Farmer

Farmer's Market

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Transportation

Food Miles Worksheet

Vocabulary for this activity:

Fossil fuels: *a combustible organic material such as oil, coal or natural gas*

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Greenhouse gases: *gases such as carbon dioxide, methane and ozone that act as a shield that traps heat in the earth's atmosphere*
Climate Change: *a long-term change in the earth's climate/weather patterns, including changes in temperature, wind patterns and rainfall (effects include: rise in sea level, melting glaciers, increases in intensity of extreme weather events such as drought or hurricanes)*
Food miles: *the distance food travels from farm (where it is produced) to plate (the consumer)*

Transporting food long distances uses many fossil fuels and emits greenhouse gases that contribute to climate change. Follow the steps below to figure out how many greenhouse gas emissions are produced as your food travels from farm to your plate!

Step 1: Using your food cards, determine if the food you're calculating is local or imported. For our lesson, local is everything grown *within* Pennsylvania. If it is grown outside PA, it is imported.
Step 2: Read through each food card to find out what steps your food took to get here. Add up all those miles to get a total number of miles traveled. Record this number in the table on the back of this worksheet.
Step 3: Which method of transportation did your food use to get here? Was it by plane, boat, train, truck? This also should be listed on your food card. Record it on your worksheet.
Step 4: Calculate the GHGs of your food by multiplying the miles it traveled by the type of transportation it used (see table below). Record this on your table as well.

Grams of GHG emissions per kilometer traveled for each pound of food:

PLANE = 1.1010
BOAT = 0.1303
TRAIN = 0.0212
TRUCK = 0.2699

For example:
A pound of tomatoes from Mexico travels 2,000 miles to reach Pennsylvania. Since it travels by truck we multiply the distance traveled by 0.2699.

2609 m x 0.2699 = 539.8 kilograms of GHG emissions

That means that 539.8 kg of GHGs are emitted into the atmosphere.

Use the chart on the back of this worksheet to record your data.

Food Miles Table

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Product	Imported Distance (miles)	Method of Transport	GHGs emitted	Local Miles	Method of Transport	GHGs Emitted
Cucumber						
Ice Cream						
Corn						
Strawberry						
Tomatoes						
Lettuce						
Bread						
Milk						
Chicken						
Honey						

Record all your calculations below to figure out how far your food travels and the GHGs emitted during that time.

Grams of GHG emissions per kilometer traveled for each pound of food:

PLANE = 1.1010
BOAT = 0.1303
TRAIN = 0.0212
TRUCK = 0.2699

Answer sheet

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Product	Imported Distance (miles)	Method of Transport	GHGs emitted	Local Miles	GHGs Emitted
Cucumber	2812.6	truck	760.2	13.1	3.5
Ice Cream	1702.6	truck	459.53	17.8	4.8
Corn	2789.6	truck	752.91	7.6	2.05
Strawberry	4939.6	plane	5438.5	12.3	3.32
Tomatoes	2819.6	train	59.77	0.1	0
Lettuce	2674.6	plane	2944.73	0.1	0
Bread	3372.6	Truck	910.26	20.5	5.53
Onion	3691.6	train	78.2	0.1	0
Chicken	1590.6	Truck	493.3	13.1	3.54
Honey	2691.6	train	57.06	18.7	5.05

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Chicken ● Raised in Cochranton, PA. ● First, transported 11.5 miles to the Market House in Meadville, PA by truck for distribution. ● Then, transported 1.6 miles to MAMS.	Chicken ● Raised at a farm in Albertville, Alabama where it was also processed and packaged. ● First, transported 593 miles to the Tyson Chicken Company in Springdale, Arkansas by truck for distribution. ● Next, transported 996 miles to Tops Grocery store in Meadville, PA by truck. ● Then, transported 1.6 miles to MAMS.
Bread ● Made from wheat grown at a farm in Espyville, Pennsylvania. ● First, wheat picked and transported 19.3 miles by truck to Creative Crust Bakery. ● Baked at Creative Crust Bakery in Meadville, PA. ● Then, transported 1.2 miles to MAMS.	Bread ● Made from wheat grown at a farm in Three for Montana and Harper, Kansas ● First, wheat transported 951 miles from Montana to Inland, Nebraska to be made into flour. ● Then, transported 1,712 miles to Auburn, Main by truck where it was baked into bread. ● Next, transported 708 miles by truck Tops in Meadville. ● Finally, transported 1.6 miles to MAMS
Ice Cream ● Made from cows' milk. The cows are raised at Little Bit of Heaven farm in Meadville. ● First, the milk was used to make ice cream at the farm. ● Next, it was transported 17.8 miles by truck to MAMS.	Ice Cream ● Made from cows' milk from a farm in Watertown, Wisconsin. ● First, milk was transported 47 miles to Milwaukee, WI by truck for pasteurization. ● Next, milk was transported 1,052 miles to Breyer's Processing plant in Framingham, Massachusetts by truck, where it was made into ice cream. ● Then, transported 23 miles to the Breyers distribution center in Boston, MA. ● Next, transported 579 miles to Meadville Tops by truck. ● Then, transported 1.6 miles to MAMS.

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Lettuce ● Grown at the MARC community garden. ● Picked and transported 0.1 mile by foot from the garden to MAMS.	Lettuce ● Grown at a farm in Castroville, California where it was picked and packaged. ● First, transported 9 miles to Salinas, California by truck and put into cold storage ● Next, transported 2,664 miles by plane to Tops Grocery store. ● Then, transported 1.6 miles by truck to MAMS.
Tomato ● Grown at the MARC community garden. ● Picked and transported 0.1 miles by foot from the garden to MAMS Corn ● Grown at Blooming Valley Farms in Saegertown, PA. ● First, picked and transported 6 miles by truck to Meadville Market House. ● Then, transported 1.6 miles to MAMS.	Tomato ● Grown at a farm in San Joaquin, California. ● First, transported 20 miles to Exeter, California by train for washing and packaging. ● Next, transported 227 miles to Oakland, California by train for distribution. ● Then, transported 2, 571 miles by train to Tops in Meadville. ● Then, transported 1.6 miles to MAMS. Corn ● Grown at a farm in San Joaquin, Claifornia to be picked and packaged. ● First, transported 124 miles to Salinas, California by truck for cold storage. ● Next, transported 2,664 miles to Meadville Tops. ● Then, transported 1.6 miles to MAMS.
Cucumber ● Grown at Fruitful Farm in Cochranton, PA. ● First, picked and transported 11.5 miles to the Market House in Meadville, PA by truck. ● Then, transported 1.6 miles to MAMS.	Cucumber ● Grown at a farm in Hermosillo, Mexico. ● First, transported 175 miles by plane to Nogales, Arizona for packaging and distribution. ● Next, transported 175 miles to Los Angeles, California by truck for distribution. ● Then, transported 2,461 miles to Tops in Meadville by truck. ● Then, transported 1.6 miles to MAMS.

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Strawberry ● Grown at Strawberry Lane Produce in Conneaut Lake, Pennsylvania. ● First, picket and transported 10.7 miles to the Market House in Meadville. ● Then, transported 1.6 miles to MAMS	Strawberry ● Grown in Jocotepec, Mexico. ● First, transported 39 miles to the airport in Guadalajara, Mexico for distribution to the US ● Next, transported 1,310 miles by plane to Los Angeles, California for distribution. ● Then, transported 3,012 miles by plan to Boston, MA for distribution. ● Next, transported 577 miles to Meadville Tops. ● Last, transported 1.6 miles to MAMS.
Honey ● Made my bees in the hives at Vorisek's Backyard Bee in Pennsylvania where it was harvested, bottled, and labeled. ● First, transported 17.1 miles to the Meadville Market House. ● Then, traveled 1.6 miles to MAMS	Honey ● Made from bees an unknown hives somewhere near Luis Obispo, California. ● First, transported 226 miles by train to Sue Bee Honey Factory in Anaheim, California where it was bottled and labeled for distribution. ● Next, transported 2,464 miles to Tops in Meadville. ● Last, traveled 1.6 miles to MAMS.
Onion ● Grown at the MARC Community Garden. ● Picked and transported 0.1 miles by food to MAMS.	Onion ● Grown at a farm in Hatch, New Mexico. ● First, transported 1,121 miles by train to Oakland, California for distribution. ● Next, transported 2,569 miles to Tops in Meadville. ● Then, transported 1.6 miles to MAMS.

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