FOODSPAN™

Teaching the Food System from Farm to Fork

[Lesson Plans, Handouts]

Complete FoodSpan curriculum, resources, student handouts, teacher guides, and presentation slides can be found at www.foodspan.org.

FOODSPAN

1. Crops: Growing Problems
How are crops grown industrially?

2. Animals: Field to Factory
How are meat, milk, and eggs produced industrially?

3. Seafood: Wild and Farmed
Where does our seafood come from?

4. The Hands That Feed Us
Who harvests, processes, serves, and sells our food?

5. Our Changing Climate
How is agriculture connected to climate change?

6. Turning Toward Sustainability
How are some people making their farms more sustainable?

7. Our Food's Journey
Why is food transported over long distances?

8. Keeping Our Food Safe
Where is our food supply at risk of contamination?

9. Processing: Farm to Factory
Why and how are foods processed?

10. Decoding Food Labels
How can we interpret the information on food packages?

11. Marketing: Under the Influence
How do food companies market their products?

12. Why We Eat What We Eat
What factors influence our food choices?

13. Our Wasted Food
How much food do we waste and why does it matter?

14. The Hunger Gap
How do hunger and food insecurity affect people?

15. Food Policy in Action
What is the role of government in the food system?

Lesson A

Exploring Our Food System

[Lesson Duration: 55 minutes, plus 25 optional minutes]

National Education Standards Alignment

- Social Studies
- Science
- Health

Lesson Overview

The **food system** is a complex network that is deeply connected to health, society, and the environment. This lesson lays the groundwork for understanding food through an integrated, systems-thinking lens. Even if teachers only cover a few *FoodSpan* lessons, we recommend they first teach this lesson to give students a foundation.

Learning Objectives

- Follow the journey of a food item through the supply chain.
- Explore relationships among food, health, society, and the environment.
- Explain why studying the food system is important.

Essential Questions

- Where does my food come from, and why does it matter?
- How is food connected to health, society, the environment, and me?

Materials

- Ball of string
- Teacher guide
- Presentation slides
- FoodSpan Infographic
- Food System Connection Cards
- Optional: Supply Chain Cards

Resources

- *The Food System* primer (www.foodsystemprimer.org/the-food-system/)

Warm-up:
Food System Brainstorm

Social Studies, Science, Health
[20 minutes]

Ask a volunteer to list the ingredients in a recent meal they ate. Ask the class: *What activities are involved in getting these ingredients to our plates?* For example, *how are the raw ingredients transformed into something we could eat? Who are the people involved at each step?* Optional: Have students respond in pictures or diagrams. List students' responses on the board in order from **field to plate**.

Split the class into three groups. Have each group brainstorm one of the following themes. Optional: Students may add to their pictures or diagrams. Refer to the ***Brainstorm Teacher Guide*** for prompts and examples.

1. Resources involved in each activity
2. Effects of each activity on health, society, and the environment
3. Influences on each activity

Have a representative from each group share their responses. Add responses to the board in order from field to plate (or invite students to do so), adding lines or arrows between related concepts. Tell students they have created their first depictions of the food system, which includes the people, activities, resources, and impacts involved in feeding people.

Main Activity:
Food System Infographic

Social Studies, Science, Health
[10 minutes]

Pass out the ***FoodSpan Infographic*** and/or display the ***FoodSpan Infographic slide***. Ask volunteers to briefly explain each part of the infographic.

Have students refer to the diagram on the board (or their own pictures or diagrams) from the warm-up. Ask:

- *Is there anything you would add to or change about our diagram(s)?*
- *Is there anything you would add to or change about the FoodSpan Infographic?*
- *Are any parts of the infographic surprising?*
- *Why is it important to look at every part of the food system?*
- *What part are you most interested in learning more about?*

Tell students they will explore the infographic in more detail in upcoming lessons.

Teacher Note: If you have time for only a few of the 17 lessons, ask students to come up to the board and post sticky notes on the parts of the infographic they are most interested in learning about. Use their votes to choose the lessons.

Optional Activity: John Muir Quote

Social Studies
[10 minutes]

As a segue to exploring connections in the food system, display the ***John Muir slide*** or read this quote aloud: *"When we try to pick out anything by itself, we find it hitched to everything else in the universe."* Have students pair up and discuss:

- *What did Muir mean?*
- *Do you agree with Muir's statement?*
- *How does it relate to the food system?*
- *What is one example of how food is connected to "everything else"?*

Ask volunteers to share their partner's responses with the class. If students need prompting, offer this example:

1. Meat and dairy production scale up to meet increased demand
2. Growth in the livestock industry increases greenhouse gas emissions
3. Greenhouse gas emissions contribute to climate change
4. Climate change increases the frequency of droughts
5. Droughts lead to crop failures
6. Crop failures lead to higher food prices

Emphasize that the food system illustrates Muir's quote because it contains many interconnected parts that all affect each other.

Main Activity: Exploring Connections in the Food System

Social Studies, Science, Health
[20 minutes]

Students will explore relationships among food, health, society, and the environment. Distribute the ***Food System Connection Cards***. Each card lists a part of the food system (on the front) and some of its relationships to other parts (on the back). Give students a minute to read their cards. If there are more students than cards, students can work in pairs or groups of three.

Have students stand up, form a circle, and hold their cards up so the fronts are visible. Give one student a ***ball of string***. Ask the student to state the part of the food system on their card and then toss the ball of string to another person while holding onto the end of the string. As they throw the ball, they should explain how the two parts are connected, for example: "I am a cow. I am connected to water because I drink it, it irrigates my feed crops, and my manure sometimes contaminates it." Continue until students have created a tangled web of connections. Students can throw to the same person more than once if there are multiple points of connection.

Once the web is complete, introduce events into the food system. For example, if a drought occurs, water should tug on their strings. Students who felt the tug should explain how they might be affected, then tug on their strings. Students who felt the second tug should explain how they might be affected, and so on. Students should see that stresses to one part of the system may have cascading consequences throughout the system.

Discuss:

- *What did this activity show you about the food system?*
- *What connections stood out to you?*
- *What connections do you want to learn more about?*

Optional Activity: Supply Chain Journey

Social Studies
[15 minutes]

Divide students into groups and hand out sets of the ***Washington Apple Supply Chain Cards.*** Ask each group to line up the cards in what they think is the correct order from field to plate. Have volunteers explain the orders they chose. Then display the ***Washington Apple Supply Chain slide*** and explain each of the steps. Ask students to compare their lists to the slide and discuss: *What is different? Why? What surprised you about the completed chart on the slide? Where would these steps go if we plotted them on the* ***FoodSpan Infographic***?

Repeat the above steps with the ***Broiler Chicken Supply Chain Cards*** and ***slides***. Note that this second supply chain is not entirely linear, as it contains several different sources of chicken feed.

"Eating... is inescapably an agricultural act, and how we eat determines, to a considerable extent, how the world is used."

– Wendell Berry

Wrap-up: Why Does the Food System Matter to Me?

[5 minutes]

Have students write a journal entry in response to the prompts: *How does the food system affect me? Why does the food system matter to me? Which part(s) of the* ***FoodSpan Infographic*** *do I relate to the most?* Optional: Have students share their responses.

Extensions:

Create Your Own Food System Infographic
(Social Studies, Science, Health)

Students will work in groups to create their own food system infographics using a variety of artistic media. Ask: *What is the most effective way to represent the interconnected parts of the food system?* Students may consider creating 3D diagrams, making a permanent version of the string web, or writing a short story or play.

Tracing Your Meal from Field to Plate
(Social Studies)

Students will research the supply chain of an entire meal. They will map the origins of every ingredient and note the people, activities, and resources involved in getting it from field to plate. Students can present their findings through posters, oral presentations, or videos. Encourage students to share highlights from their presentation on social media using #foodspan.

Share Your Knowledge: *Why does the food system matter to you? Ask students to tweet their reflections and tag* **#foodspan** *to join the conversation.*

Brainstorm Teacher Guide

	Prompts	Examples
Activities	▪ What activities are involved in getting these ingredients to our plates? ▪ How are the raw ingredients transformed into something we can eat? ▪ Who are the people involved at each step?	▪ Growing and harvesting crops ▪ Breeding, feeding, housing, transporting, and slaughtering animals ▪ Processing, packaging, transporting, storing, marketing, selling, preparing, eating, disposing of, and composting food
Resources	▪ What resources are used in each activity? ▪ Consider both natural and human resources.	▪ Natural resources, (e.g., land, water, soil, fossil fuels) ▪ Labor, knowledge, money, machinery, fertilizers, pesticides, animal feed
Effects on health, society, environment	▪ How could each activity affect health, society, and the environment? ▪ Consider both positive and negative impacts. ▪ For positive impacts, think about the reasons we process food (e.g., to preserve it), for example, or why we transport it long distances (e.g., to provide year-round variety).	▪ Positive impacts: feeding people, promoting health, creating jobs, strengthening communities, convenience, enjoyment, cultural expression ▪ Negative impacts: chronic disease, foodborne illness, worker injuries, hunger, greenhouse gases, air and water pollution, resource depletion, biodiversity loss, animal suffering
Influences	▪ What are some factors that influence each activity? ▪ Consider both societal and ecological factors. ▪ Think about how farmers decide what crops to grow, for example, or why we eat what we eat.	▪ Influences on the supply chain: consumer demand, government policy, technology, worldview, climate, geology, biodiversity ▪ Influences on what we eat: taste, cost, values, family, friends, culture, food availability, marketing, government policy

Food System Connection Cards (p.1 front)

Fish	Crop	Water	
Pathogen	Chicken	Soil	
Compost	Cow	Climate	

- Essential members of aquatic ecosystems
- Needs freshwater or saltwater (depending on the species) and food
- May be eaten by humans or other animals

- Disease-causing microorganism
- Some strains live in the guts of animals
- May be transported via air, water, soil, or food

- Made by decomposing manure, food waste, plant matter, or other organic materials
- Can be applied to soil to make it more fertile, helping plants grow

- Needs sun, water, fertile soil, carbon dioxide, and oxygen
- Produces food and oxygen
- Can be composted to enrich soil

- Needs food, land, air, water, and humane living conditions
- Can be raised for meat or eggs
- Produces manure

- Needs food, land, air, water, and humane living conditions
- Can be raised for meat or milk
- Produces manure and methane

- Needed by plants, animals, and humans
- Used for irrigating crops
- May be contaminated by animal waste, chemical fertilizers, and other pollutants

- Supports plant life
- Subject to contamination and erosion
- Contains ecosystems that are mostly microscopic

- The prevailing weather conditions in an area over a long period
- Affects what kind of plants and animals can survive in a region

Food System Connection Cards (p.1 back)

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Food System Connection Cards (p.2 front)

Supermarket	Truck Driver	Pesticide	
Government	Food Service Worker	Chemical Fertilizer	
Food Citizen	Corner Store	Farm Worker	

Food System Connection Cards (p.2 back)

▪ Often provides a wider variety of healthy options, at lower prices, than smaller stores	▪ Enacts policies that affect farming practices, food safety, hunger relief, minimum wage laws for food chain workers, and more	▪ Buys and consumes food ▪ Takes action on food system issues by voting, organizing, and writing to government officials
▪ Transports food in vehicles that use fossil fuel and produce pollution ▪ Needs healthy food, air, water, safe working conditions, and a living wage	▪ Prepares and serves food in restaurants and cafeterias ▪ Needs healthy food, air, water, safe working conditions, and a living wage	▪ Typically offers a smaller variety of options, at higher prices, than supermarkets
▪ Kills weeds, insects, fungi, or other pests that damage crops ▪ Can contaminate food, soil, air, and water and cause health problems	▪ Helps plants grow ▪ Can contaminate water and cause health problems	▪ Plants, tends, and/or harvests food crops ▪ Needs healthy food, air, water, safe working conditions, and a living wage

Washington Apple Supply Chain Cards

Growing

Apples grow in orchards

Harvesting

Apples are picked by hand

Washing, grading, waxing

A wax coating helps keep apples crisp

Packing

Apples are sorted and packed into 40-pound cartons

Distributing

Apples are transported up to thousands of miles in refrigerated trucks

Processing

Some apples may be canned or made into applesauce, pie filling, etc.

Packaging

Packaging depends on how the apples are processed, if at all

Retailing

Apples are sold in a variety of stores

Preparing

Apples can be eaten whole, added to salads, cooked in pies, etc.

Consuming

Apples are eaten

Disposing

Throughout the supply chain, some apples and parts of apples are discarded

Composting

Discarded apples can be composted and used to help grow more apples or other crops

Broiler Chicken Supply Chain Cards

Soy growing

Soybeans are grown for animal feed

Soy harvesting

Soybeans are harvested for animal feed

Corn growing

Corn is grown for animal feed

Corn harvesting

Corn is harvested for animal feed

Fish harvesting

Fish are harvested for animal feed

Chick hatching

Baby chickens are hatched and processed

Feed processing

Soy, corn, fish, and other ingredients are combined to make poultry feed

Producing

Over 100,000 chickens are typically raised and fed in a single facility

Processing

Chickens are slaughtered, defeathered, and sanitized

Retailing

Packaged chicken products are sold in supermarkets and other stores

Preparing

Chicken products are cooked

Consuming

Chicken products are eaten

Lesson B

Industrialization of Agriculture

[Lesson Duration: 50 minutes]

National Education Standards Alignment

Social Studies

Lesson Overview

Agriculture has dramatically transformed over the last century. Using a timeline and short readings, students will explore key milestones in the history of agriculture, with a focus on industrialization and the reasons behind it.

Learning Objectives

- Examine what percentage of human history has included agriculture.
- Explain how new industrial agriculture is, given the long history of agriculture.
- Describe how and why agriculture was industrialized, and its impacts.

Essential Questions

- How and why did agriculture become industrialized?
- Do the benefits of industrial agriculture outweigh the harms?
- What lessons from the history of agriculture might guide the future of our **food system**?

Materials

- Tape
- Flipchart paper and markers
- Student handout
- Presentation slides
- Agriculture Timeline Cards
- Agriculture Timeline Teacher Guide
- *Industrialization of Agriculture* primer

Resources

- *History of Agriculture* primer (www.foodsystemprimer.org/food-production/history-of-agriculture/)
- *Industrialization of Agriculture* primer (www.foodsystemprimer.org/food-production/industrialization-of-agriculture/)

Warm-up: Farms, Then and Now

Social Studies [5 minutes]

Display the ***Farms, Then and Now slide***. Ask students to compare these images of typical 19th and 21st Century farms in the United States and list similarities and differences. Ask volunteers to share their observations. Note that the 21st Century farm is larger, more mechanized, and more specialized—a result of the industrialization of agriculture. Explain that the industrialization of agriculture radically transformed how most of the world's food is produced.

Main Activity: Agriculture Timeline

Social Studies [20 minutes]

This activity places the industrialization of agriculture in historical context.

Draw a timeline on the board, spanning 200,000 BCE to the present, with marks every 10,000 years. If the board is not long enough, use sticky notes to mark the timeline along the length of the classroom. Select five volunteers, and hand each one an ***Agriculture Timeline Card***. Have them ***tape*** their card to the timeline using their best guess of when their event happened. Ask them to explain why they placed their cards where they did. As a class, discuss: *Do any of the cards need to be moved?*

Display the ***Agriculture Timeline slides***. Using the ***Agriculture Timeline Teacher Guide***, explain the significance of each event. Ask a volunteer to rearrange the cards as necessary. Discuss: *What is most surprising to you about the timeline? What does the timeline tell you about how long agriculture and industrial agriculture have been around?*

Main Activity: Trends in Industrial Agriculture

Social Studies [20 minutes]

Divide the class into five groups and explain that they will explore five major trends associated with the industrialization of agriculture.

Distribute copies of the ***Industrialization of Agriculture primer***. Assign each group one trend—specialization, mechanization, the rise in chemical and pharmaceutical use, consolidation, or market concentration. Have each group read the relevant primer section and prepare a presentation about their trend. Provide them with ***flipchart paper*** and ***markers*** for use in their presentation. Before groups present, distribute the ***Trends in Industrialization Handout***. While their classmates are presenting, instruct students to fill in their handouts.

Presentations should address the following:

- How would you describe your trend?
- Why did your trend occur? (rationale)
- How has your trend impacted agriculture or other parts of the food system? Provide supporting evidence.

Discuss: *What are the pros and cons of industrial agriculture? Do the benefits outweigh the harms?* Lessons 1-6 provide additional evidence to help students answer these questions.

Wrap-up: Reflecting on the Future of Our Food System

[5 minutes]

Have students write a response to the prompt: *What lessons can we learn from the history of agriculture that might help guide the future of our food system?* Optional: Have students share their responses.

Share Your Knowledge: *How has agriculture changed over the last century? What changes were most surprising? Ask students to tweet their reflections and tag* **#foodhistory** *and* **#foodspan** *to join the conversation.*

Extensions:

Agricultural Technology Research Project
(Science, ELA)

To deepen their understanding of the role of technology (for better or worse) in the food system, students will research an agricultural innovation such as the plow, the steam engine, the Haber-Bosch process, or herbicide-resistant corn. Using papers, posters, oral presentations, or videos, students should address the following: *How was this technology invented? What problem(s) did it aim to solve? What were the intended and unintended effects for health, society, and the environment?*

Company History Research Project
(Social Studies, ELA)

To learn more about market concentration in the food system, students will research the history of an influential food company such as Monsanto, Cargill, Tyson, or Dean Foods. Using papers, posters, oral presentations, or videos, students should address the following: *How has the company changed over time? What products does this company sell? What percentage of the market for these products does this company control? How does this level of control affect the food system?*

Diving Deeper: Changes in Diet
(Health, FACS, ELA)

Students will research historical shifts in diets: *How have changes in the food system affected what people eat? How would students' diets differ if they lived 50 years ago? 500 years ago? 50,000 years ago?* Students could create a menu featuring meals that were typical during different periods of human history. Students may also research, cook, and present a series of recipes aligned with different historical periods. Encourage students to share their findings on social media and tag #foodspan and #foodhistory. In keeping with the lesson's history theme, students can post on Thursdays and tag #throwbackthursday or #tbt.

Food System Film
(Social Studies, Health)

Students will watch a documentary about the food system, such as *Food, Inc.* (www.imdb.com/title/tt1286537/) or *King Corn* (www.kingcorn.net/), and write a reflection on how agriculture has changed.

Agricultural Timeline Cards

Earliest evidence of Homo sapiens (anatomically modern humans)	**Earliest evidence of agriculture**
Most species of farm animals domesticated	**Agriculture practiced on every major continent except Australia**
Widespread adoption of industrial agriculture	

Agricultural Timeline Teacher Guide

Refer to the ***History of Agriculture*** **primer** for references and additional details.

194,000 BCE Earliest evidence of Homo sapiens (anatomically modern humans)	▪ For the vast majority of our time on Earth, we acquired food by gathering it from the wild. ▪ Wild plant-based foods and fungi were important staples in the Paleolithic diet. ▪ While our ancestors' search for food is often depicted as an epic conflict against woolly mammoths, woolly rhinos, giant elk, and other prehistoric megafauna, early humans also took to foraging for insects and scavenging the remains of dead animals.
11,000 BCE Earliest evidence of agriculture	▪ From as early as 11,000 BCE, humans began a gradual transition away from a hunter-gatherer lifestyle toward agriculture — the cultivation of crops and animals for food. ▪ Why did people give up hunting and gathering for farming? There are many plausible reasons, all of which likely played some role at different times and across different parts of the world: ▫ **Changes in climate** may have made it too cold or too dry to rely on wild food sources. ▫ **Greater population density** may have demanded more food than could be harvested from the wild, and farming provided more food per acre, even if it did require more time and energy. ▫ **Overhunting** may have helped push woolly mammoths and other megafauna to extinction. ▫ **Changing technology**, such as domesticated seeds, would have made agriculture a more viable lifestyle.
6,000 BCE Most species of farm animals domesticated	▪ By 6000 BCE, most of the farm animals we are familiar with today had been domesticated.
5,000 BCE Agriculture practiced on every major continent except Australia	▪ The shift to agriculture is believed to have occurred independently in several parts of the world, including Northern China, Central America, and the Fertile Crescent — a region in the Middle East that gave rise to some of the earliest civilizations. ▪ Agriculture is thought to have been practiced sporadically for the past 13,000 years, and has been widely established for only 7,000 years. In the long view of human history, this is just a flash in the pan compared to the nearly 200,000 years our ancestors spent gathering, hunting, and scavenging in the wild. ▪ **If the history of modern humans were compressed into a single year, we would not have started farming until the evening of Dec. 7.**
1900s Widespread adoption of industrial agriculture (e.g., synthetic fertilizers, pesticides, monocultures)	▪ First introduced in the early 1900s, synthetic fertilizers dramatically increased crop yields, though not without consequences (covered in later lessons). ▪ They have been credited with feeding the lion's share of a global population that grew from 1.6 to 6 billion over the 20th century. ▪ After synthetic fertilizers were introduced, other aspects of industrial agriculture, such as the heavy use of pesticides, would soon follow. ▪ **If the history of agriculture were compressed into a single year, we would not have introduced industrial agriculture until the evening of Dec. 28.**

Trends in Industrialization Handout

Trend	Description	Rationale	Impact
Specialization			
Mechanization			
Rise in chemical and pharmaceutical use			
Consolidation			
Market concentration			

Lesson 1

Crops: Growing Problems

[Lesson Duration: 45 minutes]

National Education Standards Alignment

- Social Studies
- Science
- Health

Lesson Overview

Students will explore how crops are grown in industrial agriculture and how those practices impact human health and **ecosystems**. This lesson also covers the importance of soil, freshwater, and biodiversity in agriculture. In later lessons, students will learn in more detail about ecological alternatives to industrial crop production.

Learning Objectives

- Describe the importance of soil, freshwater, and biodiversity in agriculture.
- Explain how food crops are grown in industrial agriculture.
- Describe and analyze the impacts of industrial crop production on ecosystems and human health.

Essential Questions

- How does industrial crop production impact human health and ecosystems?
- If the prevailing practices in industrial agriculture continue, what kind of **food system** can we expect in the future?

Materials

- Paper for drawing
- Student handout
- Presentation slides
- *Crops and Ecology* primer
- FoodSpan Infographic

Resources

- *Crops and Ecology* primer (www.foodsystemprimer.org/food-production/crops-and-ecology/)
- Growing Solutions film (www.foodspan.org/films/growing-solutions.html)

Teacher Note: *Refer to Lesson B for background on the industrialization of agriculture.*

Warm-up: Visualizing Industrial Agriculture

Science, Social Studies
[10 minutes]

Ask students to draw a picture or write a description of what they imagine when they think about crop production. After a few minutes, show students the images of industrial crop production on the ***Monoculture slide*** and ask students to compare and contrast:

- *What is most surprising about the real images?*
- *How, if at all, does your impression differ from reality?*
- *If there was a difference, why do you think our impressions differ from reality?*
- *What do you think are some of the advantages of growing crops industrially?*

Explain that these pictures show what is known as monoculture, meaning that one crop is grown by itself, rather than with a diversity of other plants as typically happens in natural ecosystems. Ask: *What do you think are the consequences of having only one plant species growing over a large land area? Is that what occurs in nature?* Note that biodiversity, or having a variety of species in the same ecosystem, can help with pest management, soil fertility, and other needs on the farm. Without biodiversity, industrial agriculture needs to rely more on agricultural chemicals and other inputs to be productive.

Main Activity: How Are Crops Grown in Industrial Agriculture?

Science, Social Studies
[10 minutes]

Display the ***Monoculture slide*** and ask: *What do farmers use to help the crops in these photos grow?* If students need prompting, ask:

- *How do farmers prevent crops from being damaged or destroyed by pests?*
- *What can be added to the soil to enable plants to grow faster?*
- *How do crops get water besides from rain? (**irrigation**) What is required to transport water through irrigation systems?*
- *What machines do farmers use to manage cropland? What powers those machines?*

> *"Land, then, is not merely soil; it is a fountain of energy flowing through a circuit of soils, plants and animals."*
>
> *– Aldo Leopold*

As students create a list, use guiding questions to emphasize the following inputs into industrial agriculture: pesticides, fertilizers, freshwater, and fossil fuels. Note that except for freshwater, these inputs are not necessarily required for crops to grow, but are used heavily in industrial monocultures.

Teacher Note: *Refer to Lesson 6:* **Turning Toward Sustainability** *for more on the importance of biodiversity in agriculture.*

Main Activity:
Industrial Crop Production, Health, & Ecosystems

Science, Health
[20 minutes]

Students will work in groups to create flowcharts showing the links among industrial crop production, ecological impacts, and human health.

Display the following list from the ***Ecological Impacts slide***. Explain that these are some potential negative consequences of industrial crop production:

- **Soil erosion**
  (primer section: *Soil*)
- Decrease in bee populations
  (primer section: *Pesticide Use*)
- Emergence of pesticide-resistant weeds
  (primer section: *Pesticide Use*)
- Aquatic **dead zones**
  (primer section: *Nutrient Pollution*)
- Depletion of phosphorus and fossil fuels
  (primer section: *Fossil Resources*)
- Depletion of groundwater
  (primer section: *Freshwater*)

Divide students into groups of three or four and assign each group one of the above ecological impacts. If there are more than 20 students in class, assign the same impact to multiple groups. Distribute the ***Ecological Impacts Handout*** and the ***Crops and Ecology primer***.

Have students read the corresponding section of the primer (listed above in parentheses) and create a flow chart answering the following questions:

1. *What agricultural input(s) are involved in this impact (pesticides, fertilizers, freshwater, fossil fuels)? List as many steps as you can think of between each input and the ecological impact.*
2. *How can this ecological impact affect human health? List as many steps as you can think of between the ecological impact and its effects on human health.*

For example, here are possible answers for the group working on the impact, *decrease in bee populations:*

3. Pesticide use on crops kills insects → Bees that pollinate crops are exposed to pesticides and die → Decrease in bee populations
4. Decrease in bee populations → Fewer bees to pollinate crops → Crop yields decline → Food prices rise → Low-income populations are unable to afford enough food → Rise in malnutrition

Have each group give a brief presentation on their flowchart. Give them the option of acting out their flowcharts.

Teacher Note: *Ecological approaches to growing crops are further explored in Lesson 6 and the short film, Growing Solutions (see extension, on the next page).*

Share Your Knowledge: *How does industrial crop production affect human health and the environment? Ask students to tweet their reflections and tag* **#industrialag** *and* **#foodspan** *to join the conversation.*

Wrap-up: Reflecting on the Future of Agriculture

[5 minutes]

Have students write a journal entry in response to the prompt: *If current practices in agriculture continue, what kind of food system can we expect in the future?* Optional: Have students share their responses.

> *"If we are going to live so intimately with these [pesticides]—eating and drinking them, taking them into the very marrow of our bones—we had better know something about their nature and their power."*
>
> – Rachel Carson

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent industrial crop production. Ask: *Do these accurately and fully represent what we learned about industrial crop production? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Film: Growing Solutions
(Science, Health, Social Studies)

The Johns Hopkins Center for a Livable Future's original short film, *Growing Solutions* [http://www.foodspan.org/films/growing-solutions.html] (42 minutes), shows how farmers are innovating to protect and regenerate the resources needed for a secure farming future, especially in the face of climate change. The film features a farmer who's growing topsoil; seed-saving high schoolers; a farmer training program for military veterans; a communal system for water conservation; and a perennial style of farming that mimics the prairie. A discussion guide is provided.

Ecological Impacts Handout

These are some potential ecological impacts of industrial crop production:

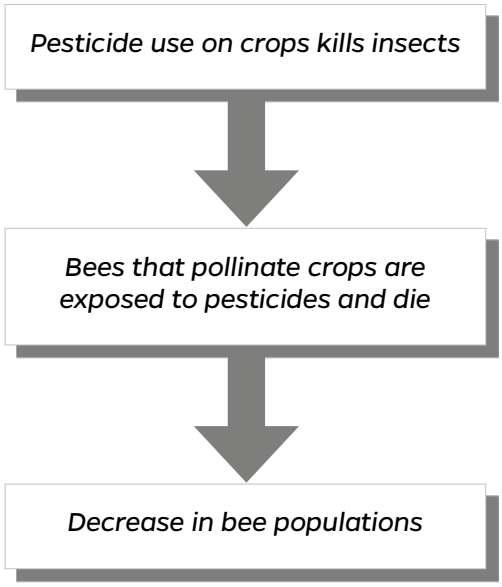
- Soil erosion (primer section: *Soil*)
- Decrease in bee populations (primer section: *Pesticide Use*)
- Emergence of pesticide-resistant weeds (primer section: *Pesticide Use*)
- Aquatic dead zones (primer section: *Nutrient Pollution*)
- Depletion of phosphorus and fossil fuels (primer section: *Fossil Resources*)
- Depletion of groundwater (primer section: *Freshwater*)

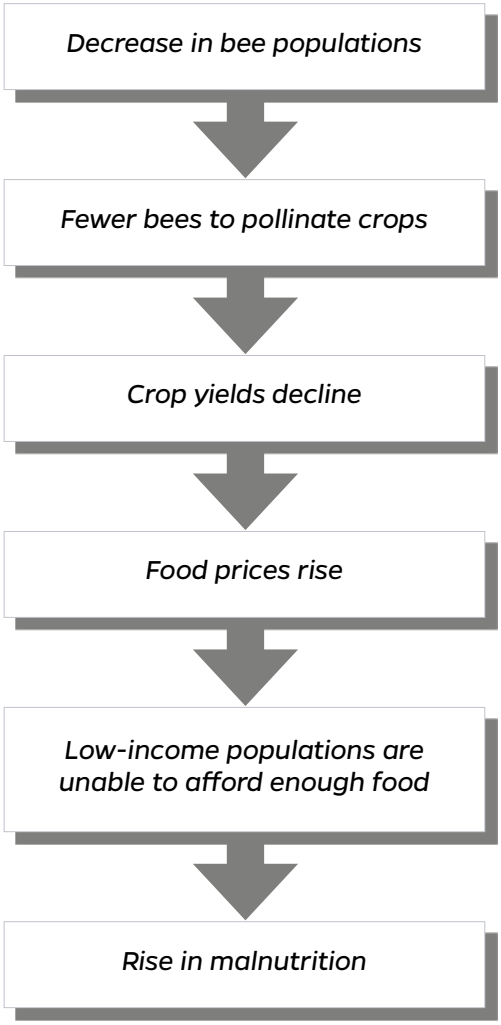
Instructions:

Your teacher will assign your group to one of the ecological impacts above. Read the corresponding section of the primer (listed above in parentheses). Then create a flow chart answering the following questions:

1. What agricultural input(s) are involved in this impact (pesticides, fertilizers, freshwater, fossil fuels)? List as many steps as you can think of between each input and the ecological impact.
2. How can this ecological impact affect human health? List as many steps as you can think of between the ecological impact and its effects on human health.

For example, here are possible answers for the group working on the event "Decrease in bee populations":





Lesson 2

Animals: Field to Factory

[Lesson Duration: 55 minutes]

National Education Standards Alignment

- Social Studies
- Science
- Health

Lesson Overview

Students will explore how animals are raised for food in the industrial system, and how it impacts human health and ecosystems. They will also look at ecological alternatives to **industrial food animal production** (IFAP) –such as pasture-based production–and consider the advantages and disadvantages of each system.

Learning Objectives

- Explain how food animals are produced in the industrial system.
- Describe the pros and cons of IFAP.
- Identify ways to mitigate the negative impacts of IFAP or move to alternative forms of production.

Essential Questions

- What are the impacts of IFAP on human health and the environment?
- What can be done to raise animals in ways that are more sustainable and humane?

Materials

- Student handout
- Presentation slides
- *Industrial Food Animal Production* primer
- FoodSpan Infographic

Resources

- *Out to Pasture* film (www.foodspan.org/films/out-to-pasture.html)
- *Industrial Food Animal Production* primer (www.foodsystemprimer.org/food-production/industrial-food-animal-production/)

Teacher Note: *Refer to Lesson B for background on the industrialization of agriculture.*

Warm-up: U.S. Animal Product Consumption

Social Studies
[5 minutes]

Instruct students to think about any two meals they ate this week and write down the foods they consumed. After they complete their lists, have students circle items that contain animal products (meat, dairy, eggs, seafood). Ask: *How frequently do animal products show up in your diet? What role, if any, do animal products play in your cultural food traditions or your family's food habits?*

The intent is to show that these products make up a large portion of most Americans' diets. Display the ***Global Animal Product Consumption slide*** and ask: *What does this chart tell you about animal product consumption in the U.S.?* Students should note that Americans consume much higher amounts of animal products than people in other countries.

Main Activity: Pros and Cons of IFAP

Science, Health, Social Studies
[10 minutes]

Students will explore the pros and cons of industrial food animal production (IFAP). Display the ***Industrial Food Animal Production slide***, which contains images of chickens raised for meat, laying hens, hogs, and beef cattle. Draw a "Pros & Cons of IFAP" list on the board, and ask for a volunteer to take notes. Begin by asking students to consider pros: *What might be some benefits to these production methods? Why do food animal operations like these exist?*

After hearing several student responses, display the ***Animal Product Prices slide*** and ask: *What does this chart tell us about the benefits of IFAP?* Students should understand that IFAP has been credited with lowering the retail prices of animal products and may be more efficient than pasture-based methods in terms of speed, labor, and land.

Display the ***Industrial Food Animal Production slide*** again and ask: *What might be some negative impacts of IFAP?* Add responses to the board. Responses may include air and water pollution, the spread of disease, and animal welfare harms. Students will explore these issues in more depth in the next activity.

Teacher Note: *Be mindful of the fact that animal products play an important role in many cultures. While IFAP has many negative impacts, the goal of this lesson is to foster inquiry and critical engagement, not to denigrate students' backgrounds.*

Main Activity:
Jigsaw Cooperative Learning: Impacts of IFAP

Science, Health, Social Studies
[25 minutes]

> *"The problem with living in a fast-food nation is that we expect food to be cheap."*
>
> - Alice Waters

Divide students into five "expert groups" and assign each one of these topics:

- Waste Management
- Antibiotic Resistance
- Community Impacts
- Worker Health and Justice
- Animal Welfare

Distribute the ***Industrial Food Animal Production primer*** to each expert group and ask them to read the section that pertains to their topic. Instruct students to consolidate the information into no more than four main points as a group. Have students record these points on the ***Impacts of IFAP Handout***.

Then rearrange the "expert groups" into "sharing groups." Each sharing group should have at least one student from each expert group. If the number of students does not allow for even distribution of group members, groups can have more than one "expert" for a topic. Each expert will share their main points and students in sharing groups will record this information on their handouts.

Emphasize that while the retail prices of animal products may be lower than they were in the 1950s, many of the negative impacts of IFAP, such as pollution and disease, are not captured in the price tag.

Teacher Note: *See Lesson 5 for livestock's contributions to climate change.*

Main Activity: Ecological Production

(Science, Health, Social Studies)
[10 minutes]

Display the ***Ecological Production slide*** and explain that a very small percentage of animal products in the U.S. are from farms that use ecological approaches. These typically involve raising animals outdoors, at lower densities, and on diverse farms that cultivate a variety of crop or animal species. Well-managed pasture-based farms avoid many of the problems of IFAP, offer farmers greater autonomy, and allow animals to express their natural behaviors.

Ask students to consider the images on the slide and reflect on these questions:

- *Do the benefits of IFAP outweigh the negative impacts?*
- *How could we change IFAP to mitigate the negative impacts?*
- *If we were to shift toward ecological approaches to raising animals for food, how would we achieve this?*

Wrap-up: Changing How Animals Are Raised for Food

[5 minutes]

Have students write a journal entry in response to the prompt: *What, if anything, should be changed about the way animals are raised for food? How can farmers, citizens, communities, and governments help bring about those changes?* Optional: Have students share their responses

> *"Once plants and animals were raised together on the same farm—which therefore neither produced unmanageable surpluses of manure, to be wasted and to pollute the water supply, nor depended on such quantities of commercial fertilizer. The genius of American farm experts is very well demonstrated here: They can take a solution and divide it neatly into two problems."*
>
> – Wendell Berry, farmer and author

Teacher Note: *Ecological approaches to raising animals are further explored in Lesson 6 and the short film,* **Out to Pasture** *(see extension, on the next page).*

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food animal production. Ask: *Do these accurately and fully represent what we learned about food animal production? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Film: *Out to Pasture*
(Science, Health, Social Studies)

The Johns Hopkins Center for a Livable Future's original short film, *Out to Pasture* (www.foodspan.org/films/out-to-pasture.html) (34 minutes), explores alternatives to IFAP through the eyes of rural communities and pasture-based farmers. A discussion guide is provided. The film is developmentally appropriate for high school students and does not contain graphic imagery.

Food Animal Production: Research Project
(Science, Health, Social Studies)

Students will choose an animal product (e.g., beef, poultry, pork, dairy, eggs) and research industrial and pasture-based approaches to producing it. In a report and/or presentation, students should summarize historical trends in that industry; potential impacts to people, animals, and the environment; state or federal policies that affect production methods; and recommendations on how the industry should change, if at all. The ***Industrial Food Animal Production primer*** provides a list of resources that serve as a good starting point.

Supermarket Survey
(Social Studies, Health)

Students will survey their local supermarkets and food stores to investigate what kind of animal products are available and how financially accessible they are. Students will investigate: *What kinds of animal products are sold? Are organic or pasture-based options available? What are the price differences between these and conventional versions of those products? What does this tell us about the accessibility of animal products that are raised in a more sustainable and/or more humane way? What costs of production in the industrial system are not included in the retail price?*

Meatless Monday Challenge
(Social Studies)

To experiment with reducing their consumption of animal products and therefore their impact on public health, the environment, and animals, students will go meatless for one day (preferably Monday). Or, they can kick it up a notch by cutting out all animal products for a week. Students will write a reflection paper addressing the following: *Was it easy to give up meat? Why or why not? What did you replace meat with in your diet? Is giving up meat an effective strategy for lessening IFAP's negative impacts? What is the role of dietary choices in improving the food system?*

Share Your Knowledge: *How does IFAP affect human health and the environment? How can we address the negative impacts of IFAP? Ask students to tweet their reflections and tag* **#IFAP**, **#foodanimals**, *and* **#foodspan** *to join the conversation.*

Impacts of IFAP Handout

Use this worksheet to record key points from the cooperative learning activity.

Waste Management

1. .....
2. .....
3. .....
4. .....

Antibiotic Resistance

1. .....
2. .....
3. .....
4. .....

Community Impacts

1. .....
2. .....
3. .....
4. .....

Worker Health and Justice

1. .....
2. .....
3. .....
4. .....

Animal Welfare

1. .....
2. .....
3. .....
4. .....

Lesson 3

Seafood: Wild and Farmed

[Lesson Duration: 45 minutes, plus 15 optional minutes]

National Education Standards Alignment

- Social Studies
- Science
- Health

Lesson Overview

Students will explore how aquatic animals are harvested from the wild and farmed (aquaculture) and how those practices impact **ecosystems**. They will also consider health benefits and risks of eating seafood. Although seafood includes both aquatic plants and animals, the focus of this lesson is on fish and shellfish.

Learning Objectives

- Describe some of the ways aquatic animals are harvested and farmed.
- Describe some of the ecological impacts of seafood production.
- Analyze the health benefits and risks of eating different types of seafood.
- Design recommendations for more **sustainable** fishing practices.

Essential Questions

- How does seafood production affect ecosystems?
- What factors should we consider when making choices about seafood in our diets?
- What would make seafood production more sustainable?

Materials

- Student handouts
- Presentation slides
- *Seafood* primer
- FoodSpan Infographic

Resources

- *Seafood* primer (www.foodsystemprimer.org/food-production/seafood/)

Warm-up:
What Does Seafood Production Look Like?

[10 minutes]

Ask students to draw a picture or write a description of how they imagine most aquatic animals are caught for human consumption. Then, present the ***Seafood Production slides***.

Ask: *What is the difference between their impressions and reality? What is most surprising about the real images?*

Most global seafood harvests use gigantic nets that are pulled through the water or along the sea floor.

Photo credit: C. Ortiz Rojas, 1997. NOAA Photo Library.

In the shrimp harvesting industry, only 5 percent of what some trawlers catch is actually shrimp, and the rest is bycatch.

Photo credit: National Oceanic & Atmospheric Adminstration, 1969. NOAA Photo Library.

Shrimp farms in Vietnam. In 2011, the U.S. imported 91 percent of its seafood.

Photo credit: American Museum of Natural History, 2009. Creative Commons CC BY-NC-SA 2.0. https://creativecommons.org/licenses/by-nc-sa/2.0/

On this Australian farm, oysters are raised in submerged bags attached to poles.

Photo credit: Saoysters, 2009. Wikimedia Commons. Creative Commons CC BY 3.0. https://creativecommons.org/licenses/by/3.0/deed.en

Main Activity:
How are Aquatic Animals Harvested and Farmed?

Science, Health, Social Studies
[30 minutes]

Students will work in groups to read about seafood production practices and document the ecological impacts and potential advantages of each.

Distribute the ***Seafood: Wild and Farmed primer*** and the ***Seafood Production Handout***. Divide the class into an even number of groups and assign half the groups the *Wild Caught Seafood* section and the other half the *Aquaculture: Farming Seafood* section. All groups should read the background section. Have students read their sections in groups and record on their handouts: 1) the different methods in their section, 2) the ecological impacts of each method, and 3) the potential advantages of each method.

Have each group choose a representative to present one seafood production method to the class. Ask for a volunteer to take notes on the board and instruct students to keep adding to their handouts. Provide time for questions, and then guide a brief class discussion with the following questions:

- *Which methods seem the most sustainable and why?*
- *Which methods seem the least sustainable and why?*
- *In general, which seems more sustainable: aquaculture or harvesting seafood from the wild? Why? Optional: Have students debate the merits of each.*
- *What can governments do to reduce ecological harms caused by seafood production? What can individuals do?*

If needed, offer the following examples of policy measures that have been used in different countries to reduce overfishing and damage to marine ecosystems:

- Temporarily stop fishing in specific areas to allow stocks to recover.
- Restrict the amount of fish allowed in aquaculture enclosures.
- Ban the most ecologically harmful fishing methods, such as dredging.
- Require a larger mesh size for nets to let small fish escape.
- Protect vulnerable aquatic ecosystems, such as coral reefs, by closing them to fishing.

Optional Activity: Health Benefits and Risks of Eating Seafood

Science, Health

[15 minutes]

Explain that seafood contains many healthy nutrients, including vitamins, minerals, and protein. However, some types of seafood also contain high levels of harmful contaminants, such as mercury and other industrial chemicals.

Provide copies of the ***Seafood Safety Handout*** and/or display the ***Seafood Safety slide***. Ask students to work in pairs to interpret this image. Solicit volunteers to explain the seafood safety message explained in the handout. Ask: *Is it safer to eat smaller or larger fish? Why are these guidelines designed for children and pregnant women?* Students can refer to the ***Seafood primer*** for more information.

Discuss:

- *Some government agencies advise people to eat more fish for the sake of health, but others point out the dangers of consuming heavy metals (e.g., mercury) that accumulate in some fish. How do we balance these conflicting recommendations?*
- *If all Americans followed recommendations for seafood consumption, could production keep up with demand? How would this affect aquatic ecosystems?*

Wrap-up: Reflecting on Our Relationship with Seafood

[5 minutes]

Have students write a journal entry in response to the prompt: *Has what you learned today changed your ideas about seafood? Will it affect your eating habits? Why or why not?* Optional: Have students share their responses.

Share Your Knowledge: *Ask students to tweet about seafood production: What should people know about where their seafood comes from? Tag* **#seafood** *and* **#foodspan** *to join the conversation.*

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent seafood production. Ask: *Do these accurately and fully represent what we learned about seafood production? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Field Trip
(Science, Social Studies)

Students will visit a fishery, seafood processing plant, or aquaculture or aquaponics facility, if those exist in the area. Students can research different steps of the production processes ahead of time and come prepared to ask questions about the impacts of the facility's methods.

Endangered Species Research Project
(Science, ELA)

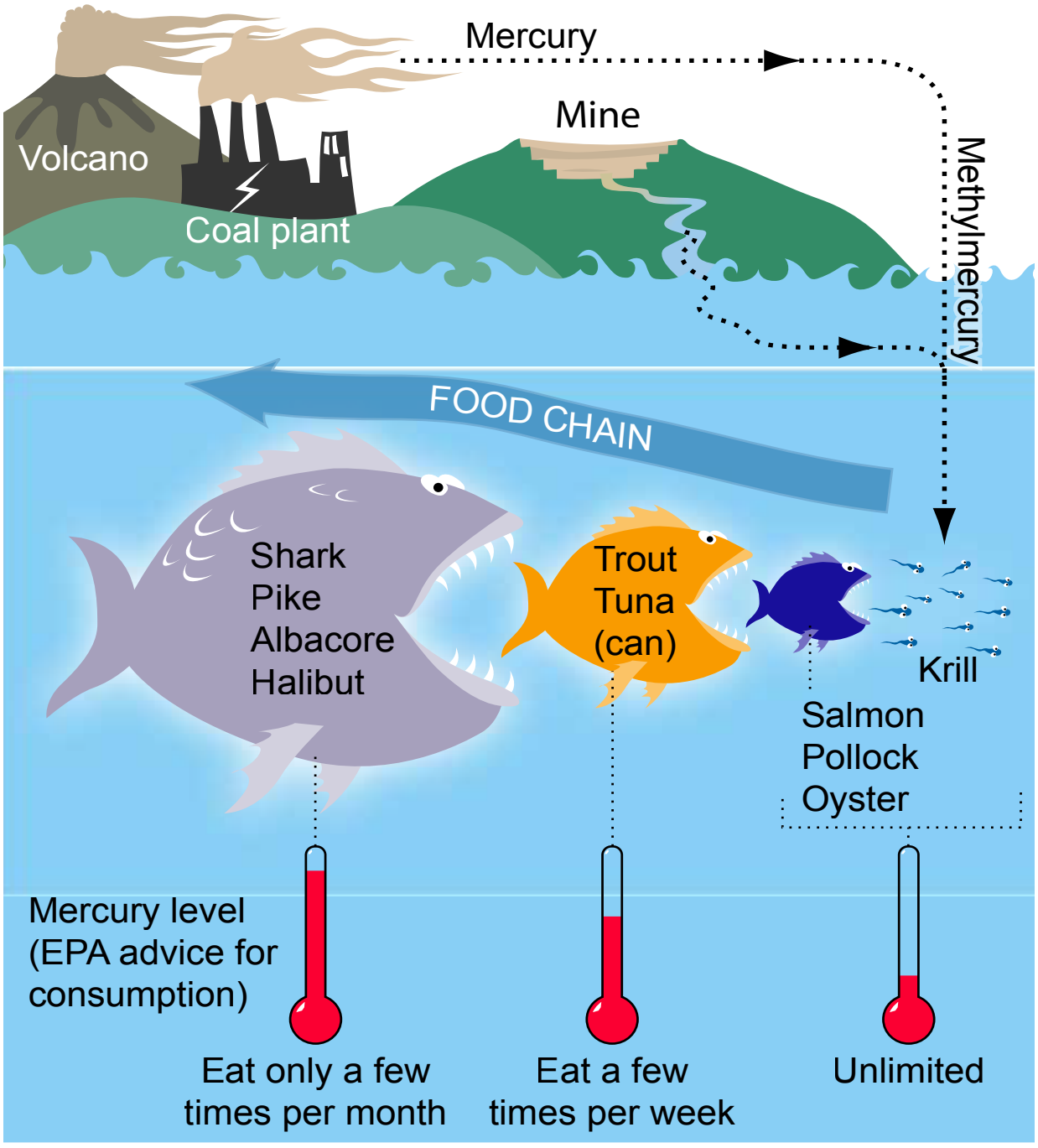
For many aquatic species, centuries of overfishing—both with traditional and industrial methods—have depleted populations well below historic levels. Now, rising ocean temperatures associated with **climate change** are also affecting many aquatic species. Some species, such as Atlantic salmon, have been nearly eliminated from many of their natural habitats, affecting people who depended on those animals for food and livelihoods. Students will research an endangered species threatened by industrial seafood production and provide recommendations for how to protect that species.

Seafood Production Handout

Seafood Production Method	Ecological Impacts	Potential Advantages

Seafood Safety Handout

These guidelines are designed to protect children and pregnant women.



What can we learn from this image?

Lesson 4

The Hands That Feed Us

[Lesson Duration: 50 Minutes]

National Education Standards Alignment

Social Studies

Lesson Overview

At least one in six members of the U.S. workforce are employed in the food chain, from farm fields to food service.[1] Students will identify different jobs, examine their working conditions, and consider how to improve workers' health and quality of life.

Learning Objectives

- Identify the roles of workers at every step in the food supply chain.
- Analyze the wages and working conditions of food chain workers.
- Describe workplace changes food chain workers are advocating for.

Essential Questions

- How are different food chain workers positively or negatively affected by their jobs?
- What can be done to improve wages and working conditions for food chain workers?

Materials

- Student handouts
- Gallery Walk Signs
- Sticky notes or index cards
- FoodSpan Infographic

Resources

- *Crops and Ecology* primer (www.foodsystemprimer.org/food-production/crops-and-ecology/)
- *Industrial Food Animal Production* primer (www.foodsystemprimer.org/food-production/industrial-food-animal-production/)
- *Food Processing* primer (www.foodsystemprimer.org/food-processing/)

Warm-up: Following Workers Along the Food Chain

Social Studies
[10 minutes]

Have students form groups and brainstorm different jobs at each step of the food supply chain. Students can refer to their ***FoodSpan Infographic*** to help generate ideas. Have students write each job on a ***sticky note*** or ***index card***, then post their jobs on the board in order from field to plate.

Discuss:

- *Which jobs are missing?*
- *Which jobs require the most people to accomplish?*
- *Which jobs involve the most physical labor?*
- *Which involve the most skill?*
- *Which jobs involve the greatest risk of injury and disease?*

Main Activity: Gallery Walk: Voices From Across the Food Chain

Social Studies
[15 minutes]

Post the four ***Gallery Walk Signs*** around the room. Have students use the ***Gallery Walk Handout*** and move from one post to the next, writing their responses to the following question concerning each job: *What risks and challenges does someone with this job face?*

As a class, share responses and discuss:

- *What surprised you about the people whose quotes you read? Which one stood out the most?*
- *In addition to your original answers, what other challenges might food chain workers face?*
- *Why would workers accept these jobs? Is it always for financial reasons alone?*
- *What would our food system be like without these food chain workers?*

Main Activity: Case Studies: Food Justice in Action

Social Studies
[20 minutes]

Divide students into groups and assign each group a worker profile from the ***Food Justice in Action Handout***. Each profile highlights some of the challenges faced by food chain workers and some of the campaigns and organizations working to promote fair wages and safer working conditions. Ask each group to read its case study and prepare a brief presentation that will:

- Describe the risks and challenges faced by these workers
- Describe the intervention to promote fair wages and/or safer working conditions
- Assess whether they think the intervention is an effective approach
- Propose an additional intervention

After each group presents, discuss:

- *Do these interventions involve many steps, and if so, what might be the first step?*
- *How might these interventions affect other workers in the food system?*
- *How might these interventions affect consumers?*
- *What arguments might be made in opposition to these interventions?*

Encourage students to consider the challenges of finding solutions that satisfy all parties.

Wrap-up: What Can We Do?

[5 minutes]

Have students write a journal entry in response to the prompt: *How can individuals, communities, and governments promote fair wages and safer working conditions for food chain workers?* Optional: Have students share their responses.

> "Our very lives are dependent, for sustenance, on the sweat and sacrifice of the campesinos. Children of farm workers should be as proud of their parents' professions as other children are of theirs."
>
> – Cesar Chavez, farm worker and labor leader

Share Your Knowledge: *Ask students to tweet about what they learned about food chain workers: What conditions do they experience? What can people do to support workers? Tag* **#foodworkers** *and* **#foodspan** *to join the conversation.*

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food chain workers. Ask: *Do these accurately and fully represent what we learned about food chain workers? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Workers' Rights History
(Social Studies, ELA)

Students will conduct a research project on an important event in the history of food chain workers' struggles, such as Cesar Chavez and the United Farm Workers' grape boycott or the Coalition of Immokalee Workers' "One Penny More" campaign. Drawing from at least three reputable sources, students will write a report examining the event, movement, or individual and the results for food chain workers.

Food Chain Workers Film Analysis
(Social Studies)

Students will watch and analyze a film about food chain workers, such as *The Hand That Feeds* (http://thehandthatfeedsfilm.com/) or *Food Chains* (http://www.imdb.com/title/tt2141739/).

In a report, students will address some or all of the following questions:

- *What risks and challenges did the workers face?*
- *What strategies did they employ to improve their conditions?*
- *What barriers did they need to overcome?*
- *Who were their allies and who was the opposition?*
- *What were their successes and failures?*

1. Food Chain Workers Alliance. *The Hands That Feed Us: Challenges and Opportunities for Workers along the Food Chain*. 2012.

Gallery Walk Handout

Instructions: Read the quotes and statistics posted for each food chain worker. Consider the risks and challenges of each job and list them in the second column below. When you are finished, think of one more food chain worker not mentioned in the activity and list any risks and challenges for that job as well. Be prepared to share your answers.

Job	Risks and Challenges
Crop worker	
Truck driver	
Meat processing worker	
Fast food worker	

Gallery Walk Sign 1

Photo Credit: Alex Proimos, 2012. Creative Commons CC BY 2.0

Gallery Walk Sign 2

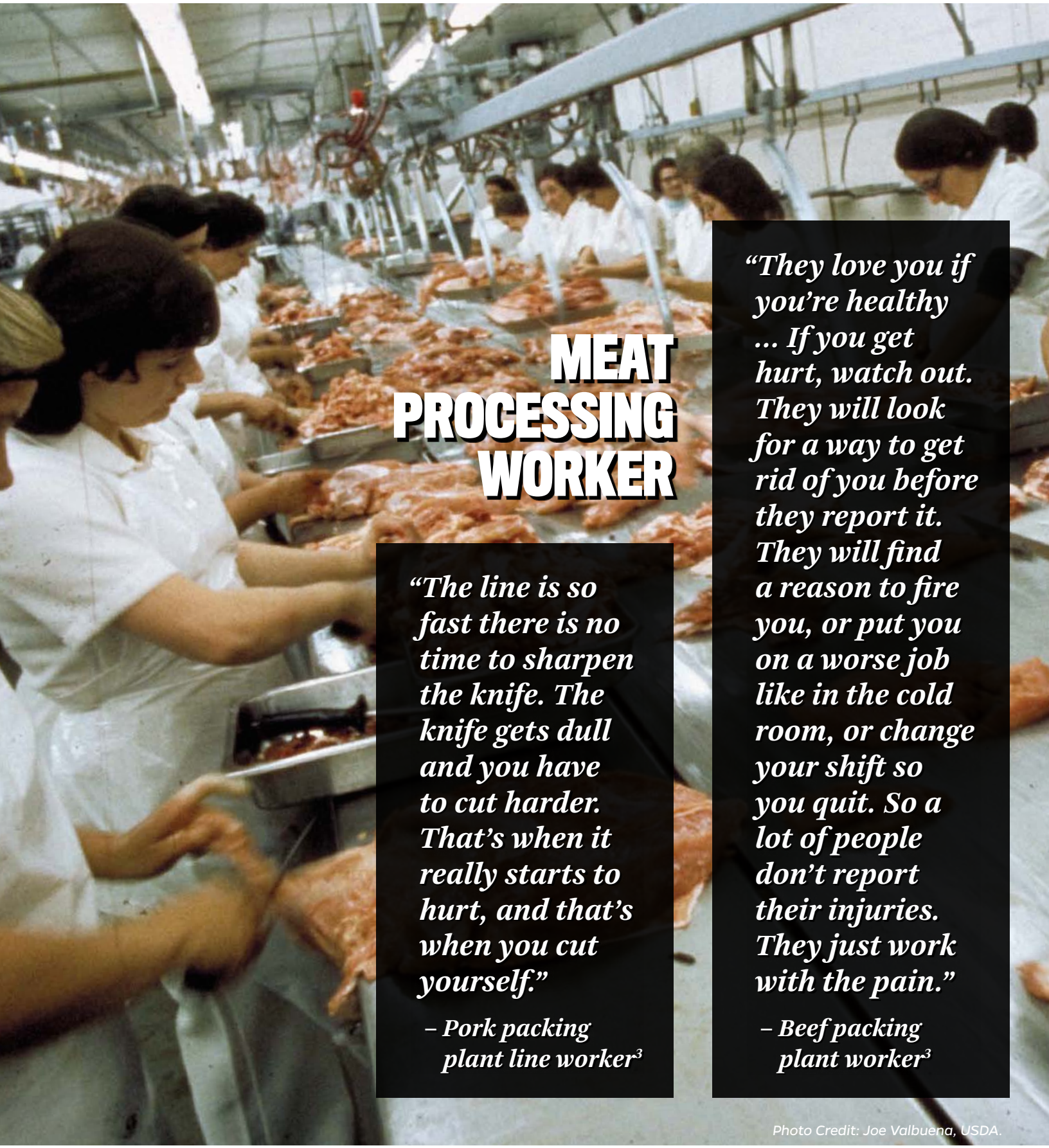
TRUCK DRIVER

"I get paid 40 cents a mile. I have days I turn in over 600 miles and days I turn in less than 200. … A really good day on the job for me is lots of miles … and being able to get to the truck stop early to find a spot and have a nice clean hot shower followed by a good meal. What makes it a really, really good day is if I am going to make it home that night after perhaps 12 to 19 days on the road."

– Commercial truck driver[2]

Photo Credit: Alex Proimos, 2012. Creative Commons CC BY 2.0.

Gallery Walk Sign 3



MEAT PROCESSING WORKER

"The line is so fast there is no time to sharpen the knife. The knife gets dull and you have to cut harder. That's when it really starts to hurt, and that's when you cut yourself."

– Pork packing plant line worker[3]

"They love you if you're healthy … If you get hurt, watch out. They will look for a way to get rid of you before they report it. They will find a reason to fire you, or put you on a worse job like in the cold room, or change your shift so you quit. So a lot of people don't report their injuries. They just work with the pain."

– Beef packing plant worker[3]

Photo Credit: Joe Valbuena, USDA.

Gallery Walk Sign 4

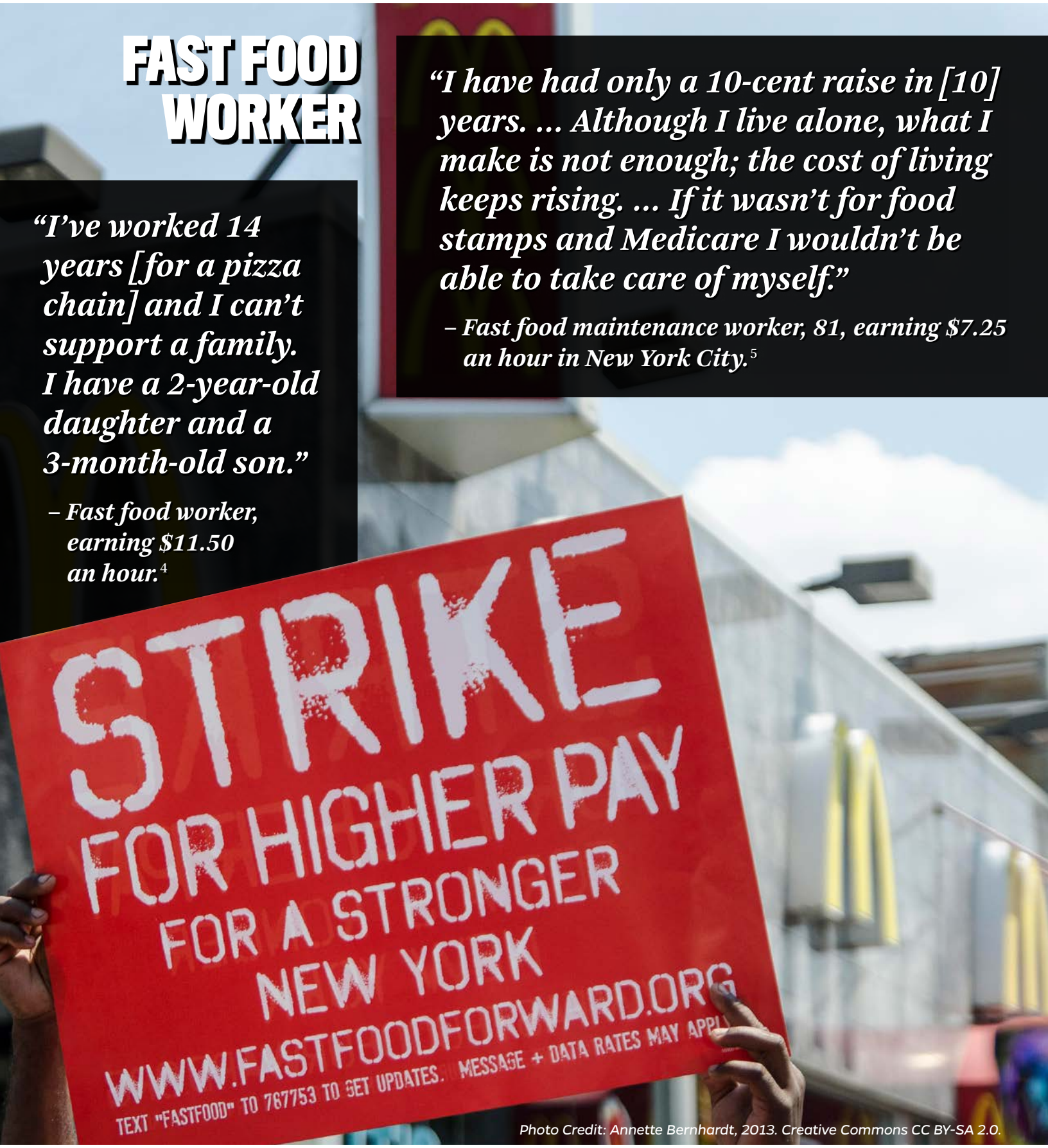


Photo Credit: Annette Bernhardt, 2013. Creative Commons CC BY-SA 2.0.

Food Justice in Action Handout

Instructions: Read your group's assigned case study and prepare a brief presentation that will:

- Describe the risks and challenges faced by these workers
- Describe the intervention to promote fair wages and/or safer working conditions
- Assess whether you think the intervention is an effective approach
- Propose an additional intervention

Crop workers

According to the National Agricultural Workers Survey, the average income of a crop worker in 2009 was less than $12,500 for individuals and less than $17,500 for a family of four. That same year, the federal poverty line was $10,830 for an individual or $22,050 for a family of four.[6] For crop workers who harvest fruits or vegetables, pay is often based on how much they pick, which is called a "piece rate." The incentive to pick more can discourage workers from taking breaks to rest, eat, or drink water and from taking days off for health or personal reasons. In 1996, a federal minimum wage was established to ensure farm workers are paid a certain amount regardless of how much they pick. However, loopholes remain, and farms and companies can bypass this law if the farms are small enough or if the workers are hired as contractors instead of as employees.[7]

In addition to the problems with piece rates, U.S. farm workers face particularly high risks of toxic exposure to pesticides, particularly when pesticides drift (are blown by wind) away from where they are sprayed.[8] Workers in crop production also suffer 80 percent more injuries compared to the national average for private industries.[9] Only one in 10 seasonal farm workers claims the ability to read or speak English fluently, potentially increasing their risks of pesticide exposure and injury (e.g., if they are unable to read warning labels). As nearly half of U.S. crop workers are immigrants who are not authorized to work in the U.S., these workers may not seek healthcare or better working conditions due to fear of employer retaliation or deportation.

The Coalition of Immokalee Workers (CIW) is campaigning for an increase in minimum farm worker wages and has developed a Fair Food Code of Conduct. By signing on to the code, companies that grow and buy produce are supporting better working conditions. Participating growers must, for example, take measures to protect workers from excessive heat, pesticides, and other hazards, and workers who feel in danger for their health or safety must be allowed to stop working (without pay) without fear of retaliation. As of 2015, 14 major buyers had signed Fair Food Agreements with the CIW, including Compass Group (the world's largest food service provider), Chipotle, McDonald's, Trader Joe's, Walmart, and Whole Foods.[10]

Truck drivers

The trucking industry is heavily regulated, and rules about how many hours truckers can be on the road per week have resulted in companies hiring more drivers to ship the same amount of cargo, often at lower wages. Some companies encourage drivers to quietly violate federal rules on the amount of hours they drive each week. Violating these rules earns drivers and shipping companies more money, but as one driver states in a 2014 *Business Insider* article, "When you're non-compliant as a driver you run the risk of fatigue and the risk of hurting other people [...] And as a driver it's my license on the line." According to the article, the driver "said he was asked by multiple trucking companies to falsify his logs, but he refused to."[11] Making matters harder for drivers, bills have been proposed that would remove limits on how many hours they can work and how large their trailers can be. Organizations such as the Teamsters (a union that represents truck drivers) and the Advocates for Highway and Auto Safety have pressured lawmakers to oppose such bills, which they say can endanger both truckers and other drivers on the road.

Meat processing workers

Although slaughterhouses and meat-processing facilities are highly mechanized, certain steps of the process must be done by hand. Some workers kill and bleed the animals while others make a series of cuts to separate fat, muscle, and bone. Plant workers may be required to use sharp tools and heavy machinery, at high speeds, under crowded conditions, for long hours, and on slippery floors—sometimes without adequate training.[3] As a result, workers in the meat-processing industry face a very high rate of injury—over 40 percent higher than the average for the private-sector American workforce.[12] To keep costs down and the volume of production high, the conveyor belts that transport animals and carcasses through facilities move at very high speeds—up to 140 birds per minute at poultry processing plants, for example.[13] Workers frequently experience chronic pain in their hands, wrists, arms, shoulders, and back from performing quick, repetitive motions. Workers who use sharp equipment, like knives, are also at risk of serious injuries due to dull and fast-moving blades.[14] Slaughterhouse workers who incur cuts, burns, or scrapes may be at greater risk of infections, particularly from antibiotic-resistant strains of bacteria.[15]

Many workers are pressured to not report their injuries. Corporations often reward facility supervisors with bonuses if they report low numbers of workers' compensation claims. One worker in Nebraska explained, "Once the company got fined for safety violations and the manager told us: 'Be careful or we'll have to pay more fines'—not be careful because you might get hurt."[3] Organizations like the Food Empowerment Project advocate for stricter regulation of slaughterhouse line speeds, limits on the amount of overtime workers can be required to do, and increased reporting of worker injuries.

Fast food workers

Fast food employees are among the lowest-paid workers in the U.S.,[16] while as of 2012, the CEOs of that industry earned over 1,200 times as much as the average worker.[17] That's more than four times the amount of CEO-to-worker inequality in the U.S. economy as a whole.[18]

In November 2012, fast food workers around the U.S. began a wave of one-day strikes to demand a $15 an hour minimum wage and the right to form a union. While their struggle was partly aimed at their employers, they also needed to combat a public perception that fast food employees are mostly teenagers who are just picking up a little pocket money. The reality is that only about 30 percent of the fast food workforce is made up of teenagers. Among adult fast food workers, a large proportion are parents (30 percent), and a much higher proportion (70 percent) have completed high school, if not more.[19]

To try to win public support for the fast food strikes, the Service Employees International Union (SEIU)—which organized the fast food strikes along with Fast Food Forward—hired a public relations firm, BerlinRosen, to help attract media coverage of the workers and their movement.[20] Numerous media outlets have covered the campaign. Despite this success, some people have criticized this PR-focused strategy—and the top-down nature of the organizing effort—as detracting from efforts to organize workers into a union. One worker lamented: "I don't like the fact that these people, the workers, are being used like pawns. … tell them what to say, what makes the best story for the media." SEIU organizers expressed concern that this kind of criticism of the campaign would only provide a public relations boost to political factions who already oppose it.[21]

References

1. Becerra H. A day in the strawberry fields seems like forever. *Los Angeles Times*. May 2013. https://www.latimes.com/local/great-reads/la-me-strawberry-pick-20130503-dto-htmlstory.html
2. Paulden J. I am a commercial truck driver in the US. What do you want to know? The Guardian. July 2013. https://www.theguardian.com/commentisfree/2013/jul/11/truck-driver-salary-life-on-road
3. Human Rights Watch. *Blood, Sweat and Fear: Workers' Rights in U.S. Meat and Poultry Plants.* 2005.
4. Sheridan PM. 'My boss doesn't rule my destiny'. *CNN Money*. May 2014. http://money.cnn.com/2014/05/16/news/companies/fast-food-protesters/
5. *Ruiz A. McDonald's maintenance worker Jose Carillo, 81, won't let his age keep him from waging the fight for fair wages for fast-food workers. New York Daily News. August 2014.* https://www.nydailynews.com/new-york/mcdonald-worker-81-fights-fair-fast-food-worker-wages-article-1.1912808
6. National Farm Worker Ministry. *Low Wages*. 2016. http://nfwm.org/education-center/farm-worker-issues/low-wages/
7. United States Department of Labor. Fair Labor Standards Act Advisor. http://webapps.dol.gov/elaws/whd/flsa/screen75.asp
8. Calvert GM, Karnik ÃJ, Mehler L, et al. Acute Pesticide Poisoning Among Agricultural Workers in the United States , 1998 – 2005. *Am J Ind Med*. 2008;51:883-898.
9. Bureau of Labor Statistics. Injuries, Illnesses, and Fatalities. 2013.
10. Fair Food Standards Council. Fair Food Code of Conduct. 2015. http://www.fairfoodstandards.org/resources/fair-food-code-of-conduct/
11. Badkar M, Wile R. Here's The Real Reason Why The Trucking Industry Is Running Out Of Drivers. *Business Insider*. August 2014. https://www.businessinsider.com/american-truck-drivers-are-getting-squeezed-out-of-their-profession-2014-8
12. Bureau of Labor Statistics. Injuries, Illnesses, and Fatalities. 2013. http://www.bls.gov/iif/
13. Zuraw L. Reactions Vary to USDA's Poultry Inspection Rule. *Food Safety News*. August 2014. https://www.foodsafetynews.com/2014/08/groups-react-to-final-poultry-inspection-rule/
14. United States Government Accountability Office. *Safety in the Meat and Poultry Industry, While Improving, Could Be Further Strengthened*. January 2005. www.gao.gov/new.items/d0596.pdf
15. Mulders MN, Haenen a PJ, Geenen PL, et al. Prevalence of livestock-associated MRSA in broiler flocks and risk factors for slaughterhouse personnel in The Netherlands. *Epidemiol Infect*. 2010;138(5):743-755.
16. Kurtzleben D. The 10 Lowest-Paid Jobs in America. *U.S. News & World Report.* March 2013. https://www.usnews.com/news/articles/2013/03/29/the-10-lowest-paid-jobs-in-america
17. Ruetschlin C. *Fast Food Failure: How CEO-to-Worker Pay Disparity Undermines the Industry and the Overall Economy*. Demos. April 2014. https://www.demos.org/research/fast-food-failure-how-ceo-worker-pay-disparity-undermines-industry-and-overall-economy
18. Horrigan L. Fast-food workers strike a blow against inequality. *Livable Future Blog*. May 2014. https://clf.jhsph.edu/node/1029/
19. Schmitt J, Jones J. *Slow Progress for Fast-Food Workers*. Center for Economic and Policy Research. 2013.
20. Larson J. Nationwide Fast Food Protests Kick Off as Demonstrators are Handcuffed in Detroit. *Vice News*. September 2014. https://www.vice.com/en/article/bjaav4/nationwide-fast-food-protests-kick-off-as-demonstrators-are-handcuffed-in-detroit
21. Gupta A. Fight For 15 Confidential. *In These Times*. November 2013. http://inthesetimes.com/article/15826/fight_for_15_confidential

Lesson 5

Our Changing Climate

[Duration: 55 minutes]

National Education Standards Alignment

- Social Studies
- Science

Lesson Overview

This lesson allows students to zoom out and see how the food system is linked to a global issue: **climate change**. Students will learn about how climate change occurs, analyze the connections between climate change and agriculture, and consider ways to reduce the food system's greenhouse gas emissions.

Learning Objectives

- Explain the science of climate change.
- Analyze how the food system contributes to climate change.
- Analyze how climate change affects agriculture.
- Propose interventions to reduce the food system's contributions to climate change.

Essential Questions

- What is the relationship between climate change and the food system?
- How can we improve the food system's impact on climate change?

Materials

- Student handouts
- Presentation slides
- Teacher guide
- Large pieces of paper
- FoodSpan Infographic

Resources

- *Food and Climate Change* primer (www.foodsystemprimer.org/food-production/food-and-climate-change/)

Warm-Up:
What is Climate Change?

Science
[15 minutes]

Explain how the food system is linked to the global issue of climate change. Display the ***Weather vs. Climate slide***, or write the following two statements on the board:

- The temperature in New York City averaged 82 degrees Fahrenheit on July 20, 2010.[1]
- The temperature in New York City averaged 77 degrees Fahrenheit for the month of July between 1981 and 2010.[2]

Ask students to reflect on the difference between these two statements. *What is similar about the measurements? What is different?* Explain that the first statement describes weather, while the second statement describes climate. A region's climate is the temperature, precipitation, humidity, and other weather conditions over a long period, whereas weather refers to those conditions over a short period of time, usually hours or days.

Ask students: *How often does weather change? Does the climate change like weather does?* No, weather changes day to day, whereas climate generally changes slowly, over decades or centuries. To gauge students' knowledge about climate change, ask: *Is our climate changing? If so, how?* Explain that climate change is a significant, lasting change in temperature, precipitation, humidity, or other weather conditions, and in the last century, the Earth's climate has begun to change much more rapidly.

Display the ***Greenhouse Effect slide.*** Ask for volunteers to describe the process depicted on the slide. Summarize the concept that greenhouse gases (GHGs) trap heat in the atmosphere. The increased accumulation of these gases due to human activity is causing global warming: an increase in average global temperatures. GHGs from human activities and natural processes include carbon dioxide (CO_2), methane (CH_4), and nitrous oxide (N_2O).

Students will complete a worksheet on sources of GHGs. Distribute the ***Sources of Greenhouse Gases Handout***. Give the students three to five minutes to complete Part 1 as best they can, then reveal the answers on the ***Sources of Greenhouse Gases slide***. Tell students they will return to the worksheet later in this lesson. Ask: *What does this information tell you about agriculture's role in climate change?*

Teacher Note: Make it active! Ask students to draw and/or physically act out the greenhouse effect, with groups of students playing each key part (CO_2, solar radiation, etc.). Play with the amount of GHGs in the atmosphere: ***What happens to solar radiation when there are fewer GHGs? What about when there are more GHGs?***

Main Activity:
Climate Change Impacts on Agriculture

Science, Social Studies
[20 minutes]

Display the ***Drought slide***. Ask: *What happened to these crops? How might climate change have been responsible?* These Texas corn crops were killed by drought—an extreme weather event that occurs more frequently because of climate change. Ask students to brainstorm other climate change-related events. Use guiding questions to emphasize the following major aspects of climate change:

- Rising sea level
- Extreme heat
- Changes in rainfall patterns
- More frequent and intense extreme weather events (e.g., droughts, hurricanes, flooding)

Students will explore how different aspects of climate change impact agriculture. Write each aspect of climate change (listed above) on a large piece of ***paper*** and post them around the room. Then display and read the ***Climate Change Impacts on Agriculture slide***, or write the following impacts on the board:

- Loss of topsoil
- Fungus invasion in corn crop
- Saltwater contamination of freshwater supply
- Increased cost to fight weeds
- Increase in a crop's water needs
- Higher food prices
- Depletion of freshwater sources for irrigation

After you read each impact aloud, students should move to the aspect of climate change they believe is responsible for that impact. Once students have made their choice, give each group of gathered students one to two minutes to discuss why they selected this aspect. Then have one volunteer from each group share with the class.

Use the ***Climate Change Impacts Teacher Guide*** to respond to students' explanations and facilitate discussion. For example, for the impact "Loss of topsoil" students could move to "Extreme heat" because it dries out the soil and makes it vulnerable to being blown away.

When food waste decomposes in landfills, it releases methane, a powerful greenhouse gas.

Teacher Note: *Refer students to the* **Crops and Ecology** *primer for details on the importance of topsoil in agriculture.*

Main Activity: Reducing Food System Contributions to Climate Change

Science, Social Studies
[15 minutes]

Distribute the ***Food System Greenhouse Gas Emissions Handout*** and/or display the ***Food System Greenhouse Gas Emissions slide***. Tell students to examine the charts and ask: *Which areas of the food system are responsible for the most GHG emissions? Are these statistics surprising? Why?*

Display the ***Livestock Greenhouse Gas Emissions slide***. Emphasize that globally, livestock production accounts for the vast majority of GHG emissions from agriculture, and more GHG emissions than the entire transportation sector.[3]

Instruct students to pair up and complete Part 2 of their ***Sources of Greenhouse Gases Handout***, which asks them to list different sources of GHG emissions from the food system, rank them in order of importance, and propose interventions that could reduce emissions from each source. Ask students to report back from their pairs. As a class, discuss: *Which sources of GHG emissions did you prioritize for interventions? Will the proposed interventions be effective? Why or why not? What steps would be involved in making them a reality? What barriers might you need to overcome?*

Note that because of industrial agriculture's contributions to climate change, urgent and dramatic shifts toward plant-centric diets and a more sustainable agriculture are necessary for mitigating catastrophic climate change.[4] These dietary changes are most important among populations that consume the highest amounts of meat and dairy. Discuss how these changes could be achieved.

Wrap-Up: Setting Priorities

[5 minutes]

Have students write a journal entry in response to the prompt: *The food system contributes to climate change in many ways. What sources of GHG emissions from the food system should we tackle first and why?* Optional: Have students share their responses.

In many parts of the world, climate change is projected to increase the duration and severity of droughts, impacting farmers and food prices.

Extensions:

Revisiting the Infographic
(Social Studies, Science)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent climate change. Ask: *Do these accurately and fully represent what we learned about climate change? If not, what could we add to make the infographic more accurate?* Working individually or as an entire class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

How Big is Your Footprint?
(Science)

Students will calculate the carbon footprint of their food choices and write a report based on their findings. *How big is your footprint? What could you do to reduce your footprint? What does this activity tell you about individuals' ability to address climate change?* Here are examples of carbon footprint calculators:

- CoolClimate Carbon Footprint Calculator (http://coolclimate.berkeley.edu/calculator)
- Eat Low Carbon (www.eatlowcarbon.org/)

Climate Change Ambassadors
(Social Studies, ELA)

Students will create an educational campaign (in the form of video PSAs, class presentations, social media campaigns, posters, etc.) to educate their peers about how they can reduce their climate impact. Students' campaigns should include individual behavior changes as well as policy recommendations. Encourage students to share their campaigns on social media. They should use the hashtags #foodandclimate and #foodspan so they can be aware of related projects done by students at other schools and collaborate if possible.

How Does Climate Change Impact Food Security?
(Social Studies)

Students will take what they have learned about climate change and its impact on agriculture and conduct a research project on how it affects food security. In a paper or presentation, students should answer the question: *How will climate change impact food security in the United States and around the world?* Refer to Lesson 14: *The Hunger Gap* and the *Hunger and Food Insecurity primer* for background reading and additional sources.

Food Choices for a Healthy Planet
(Social Studies, Science)

To play this online game, students choose a fictitious person from one of four regions of the world and follow them through their daily food decisions and the challenges that arise from them. Students gain a greater awareness of the impacts that food choices have, not only on health but also the environment and the cultures in which we live.

Share Your Knowledge: *How does the food system contribute to climate change? How can we reduce the food system's greenhouse gas emissions?* Ask students to tweet their reflections and tag **#foodspan** and **#foodandclimate** to join the conversation.

1. Weather Underground. *Weather History for KNYC*. The Weather Company. 20 July 2010. https://www.wunderground.com/calendar/us/ny/new-york-city/KLGA.
2. National Oceanic and Atmospheric Administration, National Climatic Data Center. *1981-2010 Climate Normals*.
3. Gerber PJ, Steinfeld H, Henderson B, et al. *Tackling Climate Change through Livestock – A Global Assessment of Emissions and Mitigation Opportunities*. Rome: FAO; 2013.
4. Kim B, Neff R, Santo R, Vigorito J. *The Importance of Reducing Animal Product Consumption and Wasted Food in Mitigating Catastrophic Climate Change*. Johns Hopkins Center for a Livable Future; 2015.

Sources of Greenhouse Gases Handout

Part 1

Match the greenhouse gases (GHGs) with their sources within the food system. One source can produce more than one GHG. The first source is completed for you.

Greenhouse Gases: Carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O)

Food System Source	Greenhouse Gas(es)
Decomposition of food waste in landfills	Methane, nitrous oxide
Use of nitrogen-based fertilizer on crops	
Transporting food products	
Bacterial decomposition in rice paddies	
Livestock manure	
Clearing forests for farmland	
Cattle belching	
Running agricultural machinery	

Part 2

List different sources of GHG emissions from the food system, rank them in order of importance, and propose interventions that could reduce emissions from each source. An example is provided.

Source of GHG Emissions	Rank	Intervention to Reduce GHG Emissions
Transporting Products		Transport products by rail or ship, instead of by truck or plane

Climate Change Impacts Teacher Guide

Photo credit: Bob Nichols, 2013. USDA. Creative Commons CC BY 2.0

Loss of topsoil

- Extreme heat: Heat dries out soil, making it more vulnerable to wind erosion.
- Extreme weather events: Hurricanes and flooding can damage crops and wash away soil.
- Changing rainfall patterns: Periods without rainfall can dry out soil, making it more vulnerable to wind erosion. Heavy rainfall can wash soil away.
- Rising sea level: Rising tides along coastal waterways can wash soil away.

Fungus invasion in corn crop

- Changing rainfall patterns: Long periods of heavy rain create ideal circumstances for fungal diseases to flourish and damage crops.

Saltwater contamination of freshwater supply

- Rising sea level: A higher ocean tidal range can introduce saltwater into groundwater supplies.

Increased cost to fight weeds

- Extreme heat: Temperatures rise and hardier weeds can outcompete more sensitive crops.

Increase in a crop's water needs

- Extreme heat: Heat dries out soil.
- Changing rainfall patterns: Periods with low rainfall can dry out soil.

Higher food prices

Explain to students that reduced crop yields often lead to higher food prices.

- Extreme heat: Damage from heat-tolerant weed species can lead to crop losses.
- Extreme weather events: Droughts, hurricanes, and flooding can erode soil and damage crops.
- Changing rainfall patterns: Dry periods and heavy rains can erode soil and damage crops.
- Rising sea level: Rising tides can erode soil and higher salinity can damage crops.

Depletion of freshwater sources for irrigation

- Extreme heat: Higher temperatures increase the evaporation rate. Freshwater in rivers, lakes, and groundwater may become depleted if it evaporates faster than it is replenished.
- Changing rainfall patterns: Periods with low rainfall can cause freshwater sources to dry up.

Food System Greenhouse Gas Emissions Handout

Greenhouse gas emissions by food type

Red meat (beef, pork, and lamb) and dairy production together account for nearly half of the greenhouse gas emissions associated with producing, processing, distributing, and selling food in the U.S.[1, 2]

Red meat (beef, pork & lamb)	Beverages, sweets, oil & other	Dairy	Cereals & Carbs	Fruits & Vegs	Chicken, fish & eggs
30%	21%	18%	11%	11%	10%

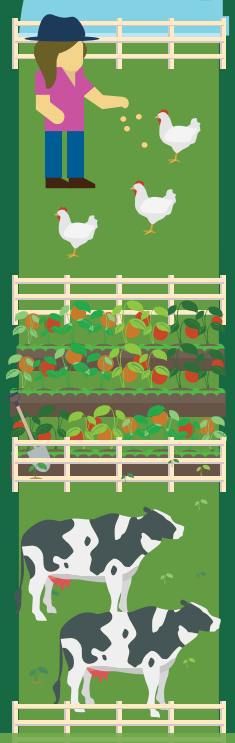
Greenhouse gas emissions by supply chain stage

GHG emissions associated with United States food supply chains are predominantly from food production (83 percent) with much smaller contributions from transporting food and food ingredients (11 percent) and food retail (5 percent). Transporting food from stores to homes, home refrigeration, cooking, and emissions from food waste were not included in these estimates, but are also significant contributors of emissions.

Production:	Transport:	Retail:
83%	11%	6%

1. Weber CL ; Matthews HS. Food-Miles and the Relative Climate Impacts of Food Choices in the United States. *Environ. Sci. Technol.* 2008, 42 (10), 3508–3513.

2. Engelhaupt E. Do food miles matter? *Environ. Sci. Technol.* 2008; 42 (10): 3482.



Lesson 6

Turning Toward Sustainability

[Lesson Duration: 45 minutes]

National Education Standards Alignment

- Social Studies
- Science

Lesson Overview

Students will explore alternatives to the prevailing industrial model of agriculture and what it means for agriculture to be **sustainable**. They will examine agroecology as an approach to food production that nourishes, rather than depletes, natural ecosystems and human communities. They will imagine what a different agricultural paradigm could look like and share that vision with others.

Learning Objectives

- Describe the core principles of sustainable agriculture.
- Describe some qualities of natural ecosystems that agroecology seeks to mimic.
- Contrast agroecological approaches with industrial agriculture.

Essential Questions

- How does sustainability apply to agriculture?
- How does agroecology support human communities and natural ecosystems?
- What kind of agriculture should we strive toward, and how will we get there?

Materials

- Student handouts
- Presentation slides
- Two sheets of paper
- FoodSpan Infographic

Resources

- *Ecological and Urban Agriculture* primer (www.foodsystemprimer.org/food-production/ecological-and-urban-agriculture/)
- *Out to Pasture* film (www.foodspan.org/films/out-to-pasture.html)
- Growing Solutions film (www.foodspan.org/films/growing-solutions.html)

Warm-up: How Does Sustainability Apply to Agriculture?

[10 minutes]

Write the word **sustainable** on the board. Ask: *What do you picture when you hear the word "sustainable"? How would you define "sustainable"?* Write student responses on the board, acknowledging that there are many ways to define sustainable.

Provide this definition of sustainable (either on the board or by displaying the ***Sustainable Definition slide***): ecologically sound, economically viable, and socially just. Ask: *Now that you know what sustainable means, how would you describe sustainable agriculture? What would agriculture look like if it met each of these criteria?* Answers can include:

- **Ecologically sound:** practiced in ways that minimize harms to the environment
- **Economically viable:** allows farmers to make an adequate living and produce sufficient food supplies
- **Socially just:** promotes the health and wellness of food chain workers and communities, and provides all people with safe, nutritious food[1]

Main Activity: Agroecology

Science, Social Studies

[15 minutes]

Students will learn about an approach to sustainable agriculture called **agroecology** (agriculture + ecology). Agroecology strives to mimic qualities of natural ecosystems to increase farm productivity in sustainable ways. Examples of these qualities include:

- **Efficiency:** Agroecology recycles and reuses resources whenever possible, just as natural systems continually recycle rainfall and organic matter.
- **Self-sufficiency:** Agroecology requires minimal inputs beyond what Nature already provides (sunlight, soil, water, and biodiversity).
- **Diversity:** Agroecology makes use of many different species of plants and animals on the same farm, and benefits from their interactions.
- **Resilience:** Agroecology can better withstand and recover from shocks like floods, hurricanes, and droughts.[2]

Write these four qualities on the board and have students consider how each might apply to agroecology, then display the ***slides*** that correspond to each quality. Refer to the ***primer*** for additional details.

Display the ***Duck-Rice-Fish Case Study slide***, distribute the ***Duck-Rice-Fish Case Study Handout,*** and have students read the case study. Have students pair up and discuss: *How does this case study illustrate agroecological qualities?* Students should record their answers in their handouts. Ask students to share their responses.

Share Your Knowledge: *What kind of agriculture should we strive toward? What benefits does agroecology offer? Ask students to tweet their reflections and tag* **#agroecology**, **#sustainableag**, *and* **#foodspan** *to join the conversation.*

Main Activity:
Industrial Agriculture Versus Agroecology

Science, Social Studies
[15 minutes]

Students will contrast industrial agriculture with agroecology. Place ***two sheets of paper*** that read "Industrial Agriculture" and "Agroecology" on opposite sides of the room. Read the statements to the right in random order. After each statement, ask students to go to the side of the room that they think corresponds to the statement. For example, for the "Grows the same crop over a large area (monoculture)" statement, students should go to the "Industrial Agriculture" side of the room.

After each statement, ask a volunteer from each side to explain why they chose their spot. Then reveal the correct answer and make sure students understand before moving on. Add each correct response to a chart on the board that has a column for Industrial Agriculture and a column for Agroecology. At the end of the activity, ask: *Did any of the answers surprise you? How has this activity changed your understanding of the difference between industrial agriculture and agroecology?*

Industrial Agriculture

- Relies heavily on use of **pesticides**, synthetic fertilizers, and fossil fuels
- Uses a lot of heavy machinery
- Grows the same crop over a large area (monoculture)
- Specializes in producing a particular crop or animal
- Uses genetic engineering to alter crop traits

Agroecology

- Looks to natural ecosystems as a guide
- Integrates a diversity of crops and animals
- Raises animals on pasture
- Rotates crops to help control pests
- Accounts for the unique qualities of a growing region (e.g., climate, geology, culture)

"Sustainability is a journey, an ongoing process, not a prescription or a set of instructions. … [Sustainable agriculture] requires that we envision the challenges and changes the future will bring."

– Fred Kirschenmann, farmer and scholar

Wrap-up: Promoting Agroecology

[5 minutes]

Have students write a journal entry in response to the prompt: *What could farmers and policy makers do to promote agroecology?* Optional: Have students share their responses.

Extensions:

Revisiting the Infographic (Social Studies, Science)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent agroecology and sustainable agriculture. Ask: *Do these accurately and fully represent what we learned about agroecology and sustainable agriculture? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Agroecology Case Studies: Gallery Walk (Science, Social Studies)

Divide students into four groups. Distribute the ***Agroecology Case Studies Handout*** and the ***Gallery Walk Handout*** to each group, and assign each group one case study. Instruct students to create a poster for their case study. Each poster should illustrate:

- The farm featured in the case study
- The crops and animals on the farm, and the interactions among them
- How the farm exemplifies qualities of agroecology

Once groups have completed their posters, hang them around the room. Instruct students to walk around the room and take notes on how each farm embodies qualities of agroecology. When they have finished, have students share what they learned about each farm ecosystem and about agroecology.

Film: Growing Solutions
(Science, Health, Social Studies)

The Johns Hopkins Center for a Livable Future's original short film, Growing Solutions [http://www.foodspan.org/films/growing-solutions.html] (42 minutes), shows how farmers are innovating to protect and regenerate the resources needed for a secure farming future, especially in the face of climate change. The film features a farmer who's growing topsoil; seed-saving high schoolers; a farmer training program for military veterans; a communal system for water conservation; and a perennial style of farming that mimics the prairie. A discussion guide is provided.

Film: Out to Pasture
(Science, Health, Social Studies)

The Johns Hopkins Center for a Livable Future's original short film, *Out to Pasture* (www.foodspan.org/films/out-to-pasture.html, 34 minutes), explores ecological approaches to livestock production through the eyes of rural communities and pasture-based farmers. A discussion guide is provided. The film is developmentally appropriate for high school students and does not contain graphic imagery.
A discussion guide is provided.

Evaluating the Sustainability of a Local Farm
(Science, ELA)

To explore how sustainable practices are implemented, students will visit a local garden or farm. Ahead of time, students will research sustainable farming techniques and create a checklist of aspects of agriculture (e.g., water use, pest management, waste management) and a list of questions for the farmer about methods (e.g., *How does your farm prevent pests from damaging crops? Do you use pesticides?*). Students will take notes on the farmer's responses. After the trip, students will write a reflection explaining what approaches the farm took and why, how sustainable those approaches are, and what could be done to make the farm more sustainable.

Shop Organic Challenge
(Social Studies, Health)

Students will visit their local supermarket to learn what it's like to try to eat only organic food. Provide students with a checklist of organic ingredients that they need to make simple healthy meals for one day. For each item, students will record the price, availability, perceived condition/quality, and ease of locating. After the trip, students will journal about their experience of shopping organic: *Do you think buying organic is something you could or should do every day? Why or why not? How might we address obstacles to buying organic?* Explain that while organic farmers often use some agroecological methods, not all organic farms are good models of sustainability (refer to the *Ecological and Urban Agriculture* primer for context).

Sustainable Design Project
(Science)

Students will research different sustainable agriculture approaches, such as agroecology or permaculture, and design a plan for a sustainable garden or farm in their neighborhood.

Teacher Note: *For the* Evaluating the Sustainability of a Local Farm *activity, make sure students are prepared to respect the farmer and ask their questions politely. Students should be sensitive to the fact that most farmers work hard and likely have complicated reasons for using certain agricultural methods.*

1. Ikerd JE. *Crisis & Opportunity: Sustainability in American Agriculture*. Lincoln, NE: University of Nebraska Press; 2008.
2. Magdoff F. Ecological agriculture: Principles, practices, and constraints. *Renew Agric Food Syst*. 2007;22(02):109

Duck-Rice-Fish Case Study Handout

Ducking the Use of Pesticides, Fertilizers in Rice Paddies

Takao Furuno, a Japanese farmer, developed a system for growing rice that mimics natural systems. He puts ducks in his paddies (flooded parcels of land used to grow rice) to eat weeds and insects. The ducks' waste puts nutrients into the water that the crops can use. This means the farmers who have mimicked Furuno's system can save money because they do not need the pesticides or fertilizers typically used to grow rice. They also earn extra money by selling duck meat and duck eggs. Furuno's system also uses fish in the paddies, which become another source of income. Industrial rice farmers had discontinued this practice because the insecticides they used in their growing system would kill their fish. The Furuno system yields 20 percent more rice than conventional systems, which grow rice exclusively.[1]

Efficiency:

Self-sufficiency:

Diversity:

Resilience:

Agroecology Case Studies Handout

1. It is all about the trees and the bees in Canada

Bees are vital to agriculture and natural biodiversity. Seventy-six percent of the world's most widely used food crops require pollination to be productive. A new Canadian initiative is looking to put bees to work to help conserve a fragile area. Trees are needed to protect watersheds—delicate areas of land that form the drainage systems for streams and rivers in which many plant and animal species thrive. Trees and shrubs help filter pollutants from stormwater runoff and anchor the soil with their roots, which reduces erosion. With a government grant, a British Columbia farm family will use their small woodland plot to blend apiculture (keeping bees for honey and pollination) with integrated agroforestry (agriculture that incorporates the cultivation and conservation of trees). In this system, the bees will pollinate the shrubs, while the trees and shrubs will provide natural windbreak protection for the bees.[2]

2. "Do nothing but microorganisms" farming in Thailand

According to a report by Horizon Solutions, in Thailand more than 20,000 farmers have adopted an integrated farming system known as "do nothing farming." They cultivate crops with minimal interference with nature, namely without plowing, weeding, pruning, or using chemical pesticides or synthetic fertilizers. They do, however, use effective microorganisms (EMs) that were developed by Dr. Teruo Higa from the agricultural department at the University of Ryukyu, Japan. EMs are a blend of microorganisms that readily exist in nature and have not been modified in any way, merely added to the fields. By enriching the soil and stimulating plant growth, EMs increase crop yields while allowing the farmer to maintain a balanced ecosystem.[2]

3. Grass farming in the United States

Joel Salatin calls himself a grass farmer. His Polyface Farms in Swoope, Va., was made famous by appearances in Michael Pollan's book *An Omnivore's Dilemma* and the documentary films *Food, Inc.* and *Fresh.* The hilly homestead is set on 100 acres of grass, surrounded by 400 acres of woodland. It is a polyculture—an agricultural system that tries to imitate the diversity of a natural ecosystem by using multiple crop and animal species in the same space. It includes chickens, cows, turkeys, rabbits, and pigs.

Salatin carefully orchestrates all the elements in an intricate symbiosis — every being follows its natural instincts to contribute an ecosystem service (benefit) that maintains the overall health of the pasture. For example, his large herd of cows feeds on a different quarter-acre of grass every day and contributes manure. Three days later, 300 laying hens—Polyface Farms' "sanitation crew" — are let loose to eat the fly larvae that have grown in the cow manure. The larvae are an important source of protein for the chickens, who fertilize the paddock with their nitrogen-rich excrement. Each year, the farm's closed-loop natural system produces 40,000 pounds of beef, 30,000 pounds of pork, 10,000 broilers, 1,200 turkeys, 1,000 rabbits, and 35,000 dozen eggs on just 100 acres. And, as Pollan writes, "at the end of the year, there is more biodiversity not less, more fertility not less, and more soil not less."[2]

4. What's good for the goose is good for the farm

Mother Goose Farms is a five-acre coffee orchard in Hawaii. Hawaii's mild climate is well suited to coffee trees. Because the land is sloping, tilling it would quickly erode the soil. Growing perennial trees avoids this problem. The trees also provide habitat for wildlife. The farm is certified organic, so instead of using herbicides, the farmers raise geese that waddle through the orchard eating weeds and fertilizing soil with their droppings. The farmers process their own coffee and sell it directly to local customers, bypassing intermediaries and allowing them to capture more of the revenue. However, what is sustainable in Hawaii might not be sustainable in Iowa. The sustainability of a farm is rooted in its own unique ecosystem, culture, and economy.[3]

1. Hossain ST, Sugimoto H, Ahmed GJU, Islam MR. (2005): Effect of integrated rice-duck farming on rice yield, farm productivity, and rice-provisioning ability of farmers. *Asian Journal of Agriculture and Development* 2(1&2): 79-86.
2. Adapted, with permission, from: Fenton I. *Five Holistic Alternative Farming Methods: Agroecology at its Best.* Worldwatch Institute. 2012. http://inesad.edu.bo/developmentroast/2012/08/inesad-news-ducks-in-rice-paddies-bees-in-bushes-and-chicken-sanitation-crews/?upm_export=print
3. Johns Hopkins Center for a Livable Future. Food System Primer. https://www.foodsystemprimer.org/food-production/ecological-and-urban-agriculture/

Gallery Walk Handout

As you review your classmates' posters, record how each case study embodies the agroecological qualities of efficiency, self-sufficiency, diversity, and resilience. Do the same for your poster, too.

Case Study #1:

Efficiency:

Self-sufficiency:

Diversity:

Resilience:

Case Study #2:

Efficiency:

Self-sufficiency:

Diversity:

Resilience:

Case Study #3:

Efficiency:

Self-sufficiency:

Diversity:

Resilience:

Case Study #4:

Efficiency:

Self-sufficiency:

Diversity:

Resilience:

Lesson 7

Our Food's Journey

[Lesson Duration: 50 minutes]

National Education Standards Alignment

- Social Studies
- Science

Lesson Overview

Food often travels thousands of miles from where it is produced to where it is sold and eaten. Students will learn why this is so and consider the advantages and disadvantages. Students will critically examine and debate different scales of **food distribution** (local, regional, national, and global).

Learning Objectives

- Explain why and how food is transported long distances.
- Critically analyze the advantages and disadvantages of different scales of food distribution (local, regional, national, and global).

Essential Questions

- Why is food transported long distances?
- What are the pros and cons of local, regional, national, and global food distribution systems?
- Which scale of distribution has the greatest net benefit for your community? For society?

Materials

- Student handout
- Presentation slides
- *Food Distribution* primer
- FoodSpan Infographic

Resources

- *Food Distribution* primer (www.foodsystemprimer.org/food-distribution/)

Warm-up:
How Far Did Your Meal Travel?

Social Studies
[10 minutes]

Ask students to choose a favorite meal and make a list of up to five main ingredients. For example, a burrito might include cheese, tomatoes, beans, cilantro and rice.

Distribute the ***Food Map of the U.S. Handout***. Students should plot on the map where each ingredient was likely produced. Have them make their best guess, plot it on the map, then research to find out if their guess was correct. If any ingredient comes from outside the U.S., students should write the name of the ingredient and its country of origin in the right-hand column.

Encourage volunteers to share their maps and lists, and ask:

- *Approximately how far did the ingredients travel before reaching your plate? What does the distance tell you about our food system?*
- *Can you find any of these ingredients locally?*
- *How feasible would it be for you to eat only locally produced food?*
- *What foods would you have to give up if you ate only locally produced food?*

Ask: *What are some of the disadvantages of transporting food long distances?* Possible responses include an increase in **food miles** and **greenhouse gas** (GHG) emissions. "Eating local" is often promoted as an important way to reduce the climate impact of our diet. What we eat and how food is produced, however, generally has a greater impact on the climate than how far food travels.

Display the ***U.S. Food System Greenhouse Gas Emissions slide***. Ask: *What percentage of U.S. food system GHG emissions is food distribution responsible for? (11%) What does this tell you about the impact of food miles?* Explain that while transporting food produces a lot of GHG emissions, the majority of food system GHG emissions come from production. For the typical American, cutting out animal products once a week would reduce GHG emissions more than following an entirely local diet.[1]

Teacher Note: *When researching the origin of an ingredient, students can search for the state or country that produces the most of that food. For example, using the search terms "U.S. state that produces the most tomatoes," students would learn that 96% of tomatoes grown in the U.S. come from California.*

Teacher Note: *The term "local food" may mean different things to different people. It is typically defined as food that was produced within 100 to 250 miles from where the consumer lives, or food that a farmer sells directly to a consumer (e.g., at a farmers market).*[2]

Main Activity: Why is Food Transported?

Social Studies, Science [15 minutes]

Have students pair up and discuss: *Can you name three reasons food is transported long distances?* Ask students to share their responses. Use these talking points to guide discussion:

Population density:

- Ask: *Can you think of places that might not have enough local farmland to support the local population?*
- Many large cities could not rely exclusively on local food, because they do not have enough nearby farmland to support their population.
- According to one estimate, if all the agricultural land in New York State was devoted to feeding New York City's population of more than 8 million, there would only be enough food to feed half of the city—with nothing left for the rest of the state.[3]

Out-of-season variety:

- Ask: *Can you think of reasons why transporting food long distances might provide consumers with a greater variety of food?*
- In northern latitudes, most food production stops during the winter. If people in those regions ate only local food, their options would be very limited unless they preserve foods to last the winter.
- Shipping food from Florida, California, Central and South America, and other southern locales can provide people with year-round variety and nutritional diversity over the winter months.
- Display the ***Top U.S. States in Fruit Production slide*** to show how much we rely on warm growing areas for out-of-season variety.

Comparative advantages:

- Some regions are better suited than others for producing certain foods. For example, the Great Plains region is ideal for growing wheat because the crop requires a vast amount of space and a cool, dry climate. So, it often makes better sense for regions to bring in wheat from the Great Plains than to grow it themselves.

> *"For most of human history... perishable foods were by definition local."*
>
> – Susan Freidberg

- Ask: *Can you think of other regions that have a comparative advantage in producing certain foods?*
- Examples include Florida and California, which have a year-round growing season for fruits and vegetables, and parts of Michigan, which have ideal soil conditions for growing blueberries.

Discuss: *What are the pros and cons of transporting food long distances? Could we do without it? If so, how?*

Photo credit: David Gubler, 2011 Creative Commons CC BY-SA 3.0 https://creativecommons.org/licenses/by-sa/3.0/

Main Activity: Debating Scales of Food Distribution

Social Studies
[20 minutes]

Divide the class into four groups. Assign each group a different scale of food distribution: local (from within 100-250 miles), regional (from your area of the country, e.g., U.S. Pacific Northwest), national, or global.

Instruct each group to prepare for a debate by making a list of the pros and cons of their scale. They can read the ***Food Distribution primer*** to further develop their arguments. Groups should be prepared to respond to the following:

- *What are some benefits of relying on your scale of distribution for all your food needs?*
- *What are some potential drawbacks?*
- *What kinds of transport vehicles does your scale of distribution rely upon? How do the energy use and GHG emissions compare for these different vehicles? (Direct students to the vehicle emissions/energy use chart in the primer.)*
- *How would using your scale of distribution affect the local economy?*
- *How would relying on your scale of distribution affect nutritional diversity for your community?*
- *Would preserving food (e.g., canning and freezing) make relying on your scale of distribution more feasible?*

Debate as a class: *Which scale of food distribution offers the greatest net benefit for your community? For society?*

Wrap-up: Reflection: Food Distribution and Me

[5 minutes]

Have students write a journal entry in response to one of these prompts: *Do the benefits of transporting food long distances outweigh the costs? Will what you learned today about food distribution change the way you shop or eat? Why or why not?* Optional: Have students share their responses.

Share Your Knowledge: *Have students share what they've learned by tweeting the most striking food distribution fact from the lesson. What should others know about food distribution? Tag* **#fooddistribution** *and* **#foodspan** *to join the conversation.*

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food distribution. Ask: *Do these accurately and fully represent what we learned about food distribution? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Eat Local Challenge
(Social Studies, Health)

Students will experiment with eating as much locally grown food as possible for an entire day or week. Have them write a reflection about the experience: *How difficult was it? Was it possible to eat local all the time? What are the barriers to eating only local food? What foods did you need to eliminate from or add to your diet?*

1. Weber CL, Matthews HS. Food-miles and the relative climate impacts of food choices in the United States. *Environ Sci Technol*. 2008;42(10):3508-13.
2. Martinez S, Hand M, Da Pra M, et al. *Local Food Systems: Concepts, Impacts, and Issues.* USDA Economic Research Service; 2010.
3. Peters CJ, Bills NL, Lembo AJ, Wilkins JL, Fick GW. Mapping potential foodsheds in New York State: a spatial model for evaluating the capacity to localize food production. *Renew Agric Food Syst.* 2008;24(1):72-84.

Food Map of the U.S. Handout

Instructions:

- Choose a favorite meal and make a list of up to five main ingredients. For example, a burrito might include cheese, tomatoes, beans, cilantro and rice.
- For each ingredient, plot on the map your best guess (or research it on the Internet) of where each ingredient was produced. If any ingredients come from outside the U.S., write the name of the country of origin and its corresponding ingredient in the right-hand column below.

Ingredients from the U.S.

1. .....
2. .....
3. .....
4. .....
5. .....

Ingredients from outside the U.S.

1. .....
2. .....
3. .....
4. .....
5. .....

National Education Standards Alignment

- Social Studies
- Science
- Health
- FACS

Lesson 8

Keeping Our Food Safe

[Lesson Duration: 50 minutes, plus 10 optional minutes]

Lesson Overview

Each year thousands of Americans experience **foodborne illnesses** caused by **pathogens** or biological toxins. Agricultural chemicals and additives in our food supply contribute to risks of chronic illnesses such as cancer. Students will explore how food becomes contaminated, the consequences for **public health**, and how to prevent and respond to **food safety** issues.

Learning Objectives

- Identify sources of food contamination throughout the **food system**.
- Explore how public health officials respond to foodborne illness outbreaks.
- Identify opportunities to improve food safety.

Essential Questions

- Where, when, and how is our food system vulnerable to contamination?
- How can we determine the origin of a foodborne illness outbreak?
- What should be done to improve food safety?

Materials

- Student handouts
- Presentation slides
- Answer Key
- FoodSpan Infographic

Resources

- *Food Safety* primer (www.foodsystemprimer.org/food-safety/)

Warm-up: Food Contamination: Where Are We Most Vulnerable?

[5 minutes]

Have students pair up and make their best guess about where food safety is threatened by chemicals or pathogens (e.g., disease-causing bacteria and viruses). Ask each pair to choose any food item and list at least three situations, from production through consumption, in which it could be contaminated.

If needed, provide students with the following example: an apple could be contaminated during production by the spraying of **pesticides**, during transportation by coming into contact with contaminated containers, or during preparation if it is sliced on a contaminated cutting board. Ask for volunteers to share and generate a list on the board.

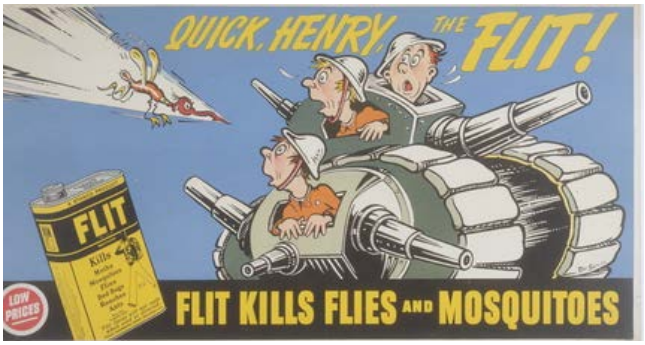
Main Activity: How Does Food Become Contaminated?

Science, Social Studies, FACS
[15 minutes]

Students will learn about the different ways food can become contaminated as it moves along the supply chain. Display the ***Presentation slides*** as an introduction to microbial and chemical contamination.

Have students read the ***Food Contamination Handout*** for a summary of ways that food can become contaminated. Ask students to compare the list from the warm-up with what they learned from the handouts. Discuss similarities and differences.

> *"Food safety involves everybody in the food chain."*
>
> – Mike Johanns, former U.S. Senator



Before writing childrens' books, Theodore Geisel (Dr. Seuss) illustrated advertisements for the pesticide DDT. Pesticides can contaminate produce and animal products.

Photo credit: Dr. Seuss Collection, Special Collections & Archives, University of California, San Diego. Used with permission.

Industries such as mining, coal burning, and manufacturing release chemicals into air, water, and soil. These chemicals can make their way into our food supply.

Photo credit: Emilian Vicol. Public domain.

Main Activity: Food Safety in Action: Outbreak Investigation

Social Studies, Science, Health, FACS
[25 minutes]

In a hypothetical scenario about a foodborne illness outbreak, students will act as local health department officials. An outbreak is defined as two or more cases caused by the same contaminated food and resulting in the same illness. Using data collected from a survey of event attendees, they will determine the food and the pathogen most likely responsible for the outbreak.

Provide pairs of students with copies of the ***Outbreak Investigation Handout*** and explain their task. Use the ***Answer Key*** to verify students' responses. Once students have completed the investigation, ask:

- *Which pathogen in which food caused the outbreak?*
- *What was challenging about this activity? What was surprising?*
- *What did you learn about how public health officials respond to outbreaks?*
- *How could an outbreak like this have been prevented?*

Optional Activity: How Do We Prevent Food Contamination?

Health
[10 minutes]

Have students work in groups to create a list of interventions to improve food safety at various points along the supply chain. Consider both behavioral and policy changes. For example:

- **Production:** Limit the use of chemical pesticides; strengthen environmental regulations to prevent manure from contaminating vegetable crops (see ***Food Safety primer*** for details).
- **Processing:** Reduce line speeds at meat processing plants to improve detection of contaminated carcasses and prevent cross-contamination; eliminate food additives implicated in health risks.
- **Transport:** Ensure transport containers are not contaminated; maintain proper storage temperatures during transit.
- **Preparation:** Wash hands and countertops; keep leftovers chilled; keep raw meat separate from other foods; cook meats and fish to appropriate temperatures.

Discuss: *What can and should policymakers, businesses, and citizens do to help promote these interventions? What can you do to reduce your exposure to food safety hazards?*

Teacher note: *In the Epidemic Curve section of the Outbreak Investigation, after students have calculated the mode incubation period, they can also calculate the mean and median incubation periods. Outbreak investigators use this information for clues about which pathogen caused the illness.*

Wrap-up: Food Safety and Me

[5 minutes]

Have students write a journal entry in response to the prompts: *Where is our food system vulnerable to contamination? How can we promote food safety? How can individuals, communities, and governments make a difference?* Optional: Have students share their responses.

Extensions:

Revisiting the Infographic
(Social Studies, Health)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food safety. Ask: *Do these accurately and fully represent what we learned about food safety? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Food Safety News Report
(Social Studies, Health, ELA)

Students will write a newspaper article or record a video newscast reporting on the foodborne illness outbreak from the main activity. Students should cover "the five W's" (who, what, where, when, why), including the steps involved in the investigation.

Food Safety at School
(Health)

Students will visit their school's kitchen and interview someone on the cafeteria staff. They should prepare a list of questions about how the school keeps people safe from foodborne illness. Students can write a reflection or give a presentation on what they learned.

Food Safety Ambassadors
(Social Studies, Health)

Students will design and implement a campaign to promote food safety in their community. This could involve creating posters or videos, writing blogs, and/or using social media.

Share Your Knowledge: *How can we promote food safety? Ask students to tweet food safety tips and tag* **#foodsafety** *and* **#foodspan** *to join the conversation.*

Food Contamination

Food safety involves protecting people from pathogens and chemicals in our food supply and—if that fails—preventing contaminated food from making people sick. Food supplies are susceptible to many different types of contaminants, for example:

Pathogens: disease-causing organisms such as bacteria, viruses, and parasites.

Food can be contaminated by pathogens at multiple points along the supply chain, including during production, processing, transport, storage, preparation and handling.

- Grasses are the natural diet of cattle. Feeding them grain, which is a standard practice in industrial operations, changes their gut environment in ways that increase populations of certain pathogens.[1]
- Poultry processing plants can legally operate at very high speeds—up to 140 birds moving down the line per minute—allowing as little as 0.43 seconds to identify and remove contaminated carcasses before they enter the food supply.[2]
- Industrial meat, dairy, and egg operations generate manure in such large quantities that it becomes difficult to safely manage. Pathogens in manure can contaminate food supplies, for example, if manure contaminates groundwater and that water is used to irrigate food crops.[3]
- Pathogens and biological toxins in food generally cause illness within hours or days of exposure. Symptoms may include cramps, nausea, and vomiting.

Chemicals: most originate from human activities, such as pesticide use in agriculture and heavy metals from coal-fired power plants.

- Industries such as mining, coal burning, and plastics manufacturing release chemicals into our environment. Many are known to be harmful, while the health effects of thousands of others are not yet understood. Because these chemicals are present in air, water, and soil, they can make their way into our food supply.
- Some potentially harmful chemicals, such as caramel color in soft drinks, are present in food or beverages because manufacturers add them directly to the product.[4]
- Agricultural pesticides give farmers some control over crop pests, such as weeds and certain insects, at least in the short term. Residues of these chemicals can remain on the fruits and vegetables we eat. Some pesticides persist in the environment and can accumulate in animals, contaminating meat and seafood.[5]
- In the U.S., growth hormones are given to cattle. It is unclear what effect these hormones may have on people who consume beef and dairy products, though some studies suggest a possible link to increased cancer risk.[6]
- Most chemical contaminants in food are associated with illnesses that develop gradually and persist over time, such as cancer, usually as a result of longer-term, repeated exposures.

References

1. Callaway TR, Elder RO, Keen JE, Anderson RC, Nisbet DJ. Forage feeding to reduce preharvest Escherichia coli populations in cattle, a review. *J Dairy Sci.* 2003;86(3):852-860.
2. Zuraw L. Reactions Vary to USDA's Poultry Inspection Rule. *Food Saf News.* 2014.
3. Graham JP, Nachman KE. Managing waste from confined animal feeding operations in the United States: the need for sanitary reform. *Water Heal.* 2010;December:646-670.
4. Smith TJS, Wolfson JA, Jiao D, et al. Caramel Color in Soft Drinks and Exposure to 4-Methylimidazole: A Quantitative Risk Assessment. *PLoS One.* 2015;10(2).
5. Dougherty C. Dietary Exposures to Food Contaminants across the United States. *Environ Res.* 2000;84(2):170-185.
6. California Breast Cancer Research Program. *Identifying Gaps in Breast Cancer Research.* 2007.

Outbreak Investigation: Description of the Outbreak

Scenario

On Wednesday, June 5, a local community organization held a fundraising crab feast for cancer research. Roughly 50 people attended. The menu included fresh steamed crabs, macaroni salad, egg salad, and sandwiches.

On Thursday, June 6, a woman who had attended the crab feast woke up feeling ill. She scheduled an appointment with her doctor. She described her symptoms as nausea, fever, chills, and body aches. On Friday, June 7, the physician noted that during the morning of her shift, she had seen several people with similar symptoms. She began asking questions about their previous activities and found they had all attended the crab feast. The doctor called the local health department to report what she suspected was a **foodborne illness outbreak.**

Start of the Investigation

The health department immediately began an investigation. A district health officer contacted patients and confirmed the doctor's report of their illnesses as well as their attendance at the crab feast. The investigator suspected the crab feast might have been the source of the illnesses.

The health department also prepared a questionnaire, which was distributed a week after the crab feast to as many people as possible who had attended the event. The questionnaire asked for the following information:

- Whether the person became ill
- What symptoms are occurring, if any
- When the symptoms began
- What foods the person ate

Out of the 50 people who attended the event, 20 responded to the questionnaire. The results are given in ***Outbreak Investigation: Questionnaire Data***. Each row represents a different person.

Parts of this activity have been adapted from: Principles of Epidemiology: Problem 1: An Outbreak of Sore Throats Following a Charity Luncheon. Johns Hopkins Bloomberg School of Public Health; 2010. Farber R.E., Korff F.A. *Foodborne Epidemic of Group A Beta Hemolytic Streptococcus.* Public Health Reports, 1958; 73(3), 203-9.

Outbreak Investigation: Questionnaire Data

Response #	Date sick	Crabs	Macaroni	Egg salad	Sandwiches
1	6th	Ate	Did not eat	Ate	Ate
2	7th	Ate	Did not eat	Ate	Ate
3	Not sick	Ate	Ate	Ate	Did not eat
4	8th	Did not eat	Ate	Ate	Ate
5	7th	Ate	Ate	Ate	Ate
6	Not sick	Did not eat	Did not eat	Did not eat	Ate
7	8th	Did not eat	Ate	Ate	Ate
8	Not sick	Ate	Ate	Ate	Ate
9	10th	Ate	Did not eat	Ate	Ate
10	8th	Did not eat	Did not eat	Ate	Did not eat
11	8th	Ate	Ate	Ate	Ate
12	7th	Did not eat	Did not eat	Ate	Ate
13	8th	Ate	Did not eat	Ate	Did not eat
14	7th	Ate	Ate	Ate	Ate
15	Not sick	Ate	Ate	Ate	Did not eat
16	7th	Did not eat	Did not eat	Did not eat	Did not eat
17	Not sick	Did not eat	Did not eat	Did not eat	Ate
18	8th	Did not eat	Ate	Ate	Ate
19	8th	Did not eat	Did not eat	Ate	Ate
20	9th	Did not eat	Did not eat	Ate	Ate

Outbreak Investigation: Attack Rate

The attack rate is the percentage of the people who became sick. Knowing about the attack rate can provide clues about which food was responsible for the outbreak.

Instructions: What percentage of the questionnaire's respondents got sick? Using the Questionnaire Data, count how many people became sick. To determine the attack rate, divide the number of sick people by the number of people who responded to the questionnaire. Write your results in the table below.

Number of respondents who got sick	Number of people who responded to questionnaire	Attack rate

Outbreak Investigation: Attack Rate by Food

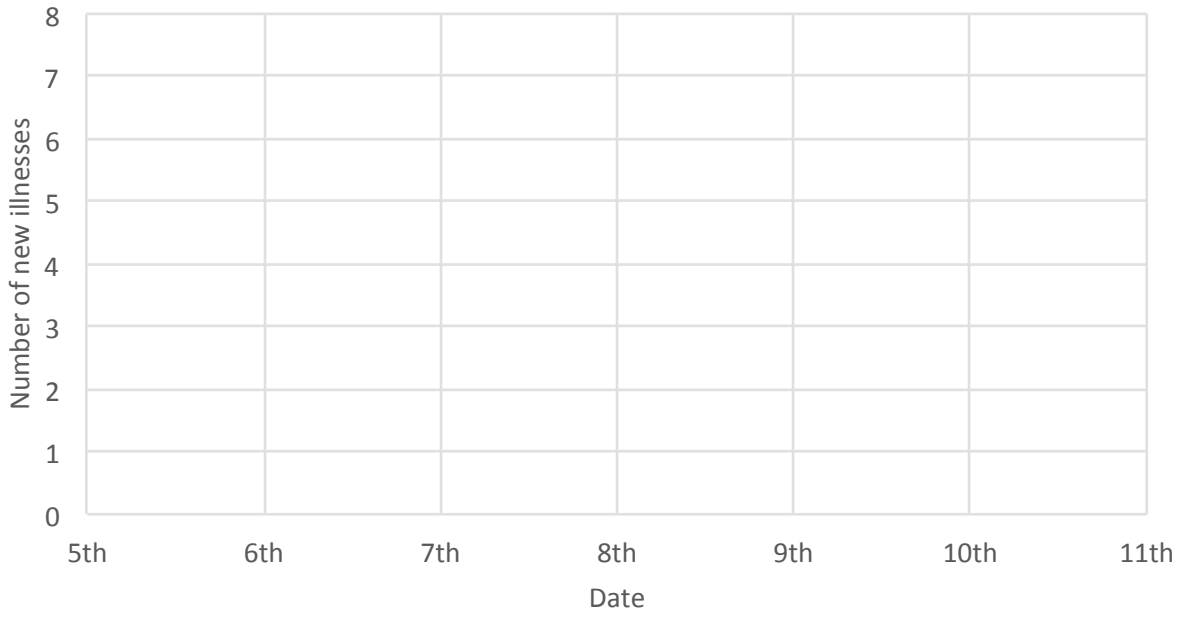
Instructions: Which food at the feast had the highest attack rate? For each food that was served, determine how many of the people who ate that food became sick. Divide this by the number of people who ate that food. The result is the attack rate for that particular food.

Food	Number of people who ate this food and got sick	Number of people who ate this food	Attack rate
Crabs	*7*	*10*	*0.70 (70%)*
Macaroni			
Egg salad			
Sandwiches			

Outbreak Investigation: Epidemic Curve

The incubation period is the time between exposure to a **pathogen** and the onset of symptoms. Knowing about the incubation period can provide clues about which pathogen was responsible for the outbreak.

Instructions: Determine when each person first reported his or her sickness. Graph your results below to determine when the majority of people became ill.



On what date did the most people become sick?.....

What is the mode (value that occurs most often) incubation period? In other words, how many days passed between the event and the date when the most people became sick?.....

Outbreak Investigation: Pathogen and Contaminated Food

Instructions: Answer the questions below about the pathogen and food that probably caused the outbreak. Consider the results of your investigation so far: the symptoms of people who became ill, the attack rate and the incubation period. Compare these against the descriptions of each pathogen below.

Which pathogen do you suspect caused the illnesses? .....

.....

Which food do you suspect was contaminated by the pathogen? .....

.....

Some of the people who said they ate this food did not get sick. What are some possible explanations?

.....

.....

.....

.....

One person (#16) did not eat any of the foods on the menu. What are some possible explanations for his or her illness?

.....

.....

.....

.....

Norovirus

Incubation period: 1-2 days

Signs and symptoms: nausea, vomiting, diarrhea

Commonly associated foods: poorly cooked shellfish, ready-to-eat foods like salads and sandwiches handled by infected persons, contaminated water

Campylobacter

Incubation period: 2-5 days

Signs and symptoms: fever, vomiting, diarrhea, abdominal cramps

Commonly associated foods: raw and undercooked poultry, unpasteurized milk, contaminated water

Salmonella

Incubation period: 1-3 days

Signs and symptoms: fever, vomiting, diarrhea

Commonly associated foods: eggs, poultry, meat, and cheese; unpasteurized milk and juice; certain raw fruits and vegetables like sprouts and melons

E. coli

Incubation period: 1-8 days

Signs and symptoms: vomiting, diarrhea, abdominal cramps

Commonly associated foods: undercooked ground beef, unpasteurized milk and juice, contaminated water

Adapted from foodsafety.gov

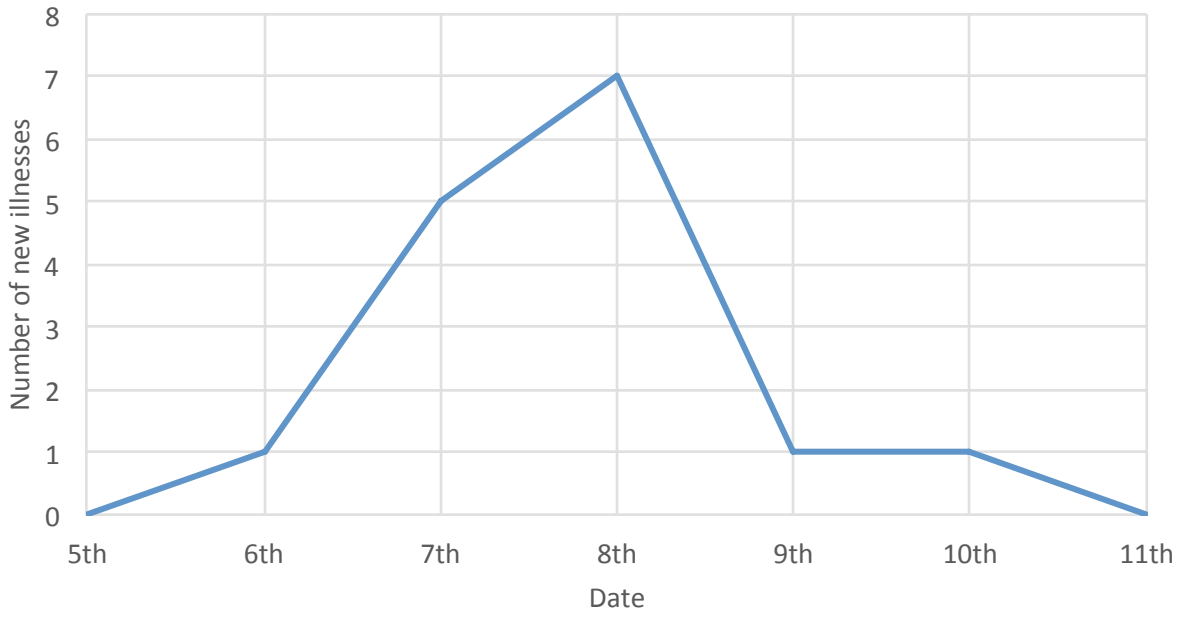
Answer Key: Attack Rate

Number of people who got sick	Number of people who responded to questionnaire	Attack rate
17	*20*	*0.85*

Answer Key: Attack Rate by Food

Food	Number of people who ate this food and got sick	Number of people who ate this food	Attack rate
Crabs	*7*	*10*	*0.70 (70%)*
Macaroni	*6*	*9*	*0.67 (67%)*
Egg salad	*14*	*17*	*0.82 (82%)*
Sandwiches	*12*	*15*	*0.80 (80%)*

Answer Key: Epidemic Curve



On what date did the most people become sick? *June 8th*

Mean, median, and mode incubation period: *3 days*

Answer Key: Pathogen and Contaminated Food

Which pathogen do you suspect caused the illness? *Salmonella*

Which food do you suspect was contaminated by the pathogen? *Egg salad*

Some of the people who said they ate this food did not get sick. What are some possible explanations?

- *People who responded to the survey may not accurately remember which foods they ate.*
- *Some people might have greater immunity to the illness because they had been exposed to it before, because they have stronger immune systems, or because they are genetically less susceptible.*
- *The people who got sick may have eaten more egg salad than those who did not. This is sometimes called "dose-response" because exposure to a larger dose of pathogens generally increases the risk and severity of illness.*
- *Because people often don't seek treatment and report their symptoms, it can be difficult to trace the source of a foodborne illness outbreak. The people who do report illness may represent only the tip of the iceberg.*

One person (#16) did not eat any of the foods on the menu. What are some possible explanations for his or her illness?

- *Person #16 may have forgotten what he or she ate.*
- *Person #16 may have been exposed to the pathogen through contact with another infected person. Proper hand washing could have prevented this type of person-to-person transmission.*
- *Person #16 may have gotten sick from a completely unrelated event, from a different pathogen. Many pathogens cause nausea, diarrhea, and vomiting.*
- *Person #16 may have suffered illness from cross-contamination from an item that did contain the pathogen. For example, someone brought leftovers home, spilled them on the counter and then, person #16 prepared food on that counter.*

Lesson 9

Processing: Farm to Factory

[Lesson Duration: 45 minutes]

National Education Standards Alignment

- Social Studies
- Science
- Health

Lesson Overview

The development of different **food processing** techniques has sometimes improved and sometimes degraded the quality of food. Food processing offers important benefits to businesses and citizens, including a more varied food supply and foods with a longer **shelf life**. Certain aspects of food processing, however, raise concerns over nutritional quality, worker health, and **food safety**. Students will learn how food is processed and explore the positive and negative impacts of food processing techniques.

Learning Objectives

- Describe different food processing techniques.
- Identify the rationale for different food processing techniques.
- Analyze positive and negative impacts of processing techniques.

Essential Questions

- Why and how are foods processed?
- What are the pros and cons of food processing?

Materials

- Boxes of 4-5 food items (see Warm-up)
- Tape
- Student Handout
- Food Processing Cards
- *Food Processing* primer
- FoodSpan Infographic

Resources

- *Food Processing* primer (www.foodsystemprimer.org/food-processing/)

Warm-up: How Processed is Your Food?

[10 minutes]

Explain that food processing techniques transform raw foods and ingredients into new products. For better and for worse, nearly all food in the U.S. is processed in some way. Divide students into groups and give each a ***box of four to five food items***. The choice of foods is not as important as making sure each box contains foods that fall along a continuum from unprocessed to highly processed. Suggested items include fresh produce, milk, pasta, breakfast cereal, and soda. Have each group line up the foods from least processed (on the left) to most processed (on the right). As a class, discuss:

- *Why did your group arrange its food the way it did?*
- *What is the relationship between how processed a food is and how healthy it is?*
- *What is the relationship between food processing and food safety?*

Main Activity: Why and How is Food Processed?

Social Studies, Science, Health

[15 minutes]

Divide students into five groups and distribute copies of the ***Food Processing primer***. Assign each group one of the following sections:

- Preservation and Food Safety
- Variety and Convenience
- Nutrition
- Meat Processing and Worker Health
- Food Packaging

Have each group read its section and discuss: *What food processing methods are described? What does this tell us about why food is processed?* Have each group choose a representative to present their responses to the class. Summarize presentations on the board and highlight food processing techniques, such as preservation (e.g., freezing, canning), **pasteurization**, **enrichment**, and **fortification**.

Canning is a preservation technique that can use glass jars (pictured) or metal cans.

Photo credit: mlhradio, 2009. Flickr. Cropped from original. Creative Commons CC BY-NC 2.0

Fermentation transforms food through the action of yeasts and bacteria. Nattō (pictured) is a Japanese dish made from fermented soybeans.

Photo credit: JD Kinchan1, 2011. Flickr. Creative Commons CC BY-SA 2.0.

Main Activity: Food Processing Pros and Cons (Science, Health)

[15 minutes]

Divide the board into three sections titled Pro, Con, and Both. Divide the class into small groups. Each group should get all 12 ***Food Processing Cards*** and every student should get one ***Food Processing Handout.*** Use the ***Food System Primer*** for background information. Have groups discuss a statement from each card and decide whether it reflects a pro, con—or both—of food processing and why. Ask students to analyze each statement from the following perspectives:

- Manufacturing company
- Food chain worker
- Retailer (e.g., grocer)
- Citizens

Instruct students to record their responses on the ***Food Processing Handout***. Then each group should take its ***Food Processing Cards*** and ***tape*** them to the appropriate sections on the board.

Ask students to explain their choices. During this discussion, have students record any new ideas on their handouts. Ask:

- *Based on the reading from the previous activity, are there other pros or cons of certain processing techniques that are missing from this list?*
- *Do the pros of food processing outweigh the cons (See Teacher Note)?*
- *How might we address some of the cons?*

Wrap-up: The Importance of Food Processing

[5 minutes]

Have students write a journal entry in response to the prompt: *Why is food processing important? How does it affect people?* Optional: Have students share their responses.

Teacher Note*: Caution students to avoid generalizing food processing as completely good or bad. It represents a wide variety of techniques, each with pros and cons.*

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food processing. Ask: *Do these accurately and fully represent what we learned about food processing? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Food Processing Inventions
(Science, Health, ELA)

Students will conduct a research project on one technological advance in food processing (e.g., enrichment, canning, freeze-drying, pasteurization). They will explore what problem the invention addressed, analyze the invention's benefits and costs, and take a stance on whether its introduction has led to a net societal benefit.

Processed Food Recipe Rewrite
(Health, ELA)

Students will research and write recipes to replace processed store-bought items. For example, they could write their own recipe for a vegetable stir-fry dish rather than a boxed version of the same dish. Students should reflect on whether this process was challenging and whether it was easier to make the less-processed dish (in terms of time, ingredient cost and availability, etc.).

***Share Your Knowledge**: How is food processed? What should people know about food processing? Ask students to tweet food processing facts and tag **#foodprocessing** and **#foodspan** to join the conversation.*

Food Processing Cards

Preservation allows businesses to transport foods over greater distances.	**Preservation allows stores to stock foods for longer periods of time.**	**Freezing and canning allow people to enjoy foods out of season, and they preserve some nutrients.**
Pasteurization destroys pathogens (disease-causing organisms) that may contaminate food.	**Large processing plants often handle large volumes of products from many different sources, which can lead to cross-contamination.**	**Processing can enhance the texture, flavor, and appearance of food.**
Processed foods can be high in refined sugars and unhealthy fats.	**Fortification allows processed foods to have higher levels of certain nutrients.**	**Food packaging accounts for roughly two-thirds (by volume) of total U.S. packaging waste.**
Some processed food packaging contains BPA, a chemical that has been linked to cardiovascular disease, certain cancers, and changes to immune system function.	**Many processed foods are designed to be eaten virtually anywhere, at any time, with little or no preparation.**	**In addition to producing a variety of flavors and textures, fermentation can promote gut health, preserve foods, improve nutritional quality, and reduce cooking times.**

Food Processing Handout

You will explore the pros and cons of processing food. Read each statement and choose whether it reflects a pro, con, or both. Analyze each statement from the following perspectives:

- Manufacturing company
- Food chain worker
- Retailer (e.g., grocer)
- Citizens

Record your responses below, along with your reasons for each choice. The first statement has been completed as an example.

1. Preservation allows businesses to transport foods over greater distances.

Pro: Gives citizens access to a greater variety of foods; gives manufacturers a wider range of products to sell.

Con: Long-distance transport can use more fuel, particularly when food is transported by air, which creates more pollution, a threat to citizens' health.

2. Preservation allows stores to stock foods for longer periods of time.

3. Freezing or canning allows people to enjoy foods for a greater part of the year with more nutrients intact.

4. **Pasteurization destroys pathogens (disease-causing organisms) that may contaminate food.**

5. **Large processing plants often handle large volumes of products from many different sources, which can lead to cross-contamination.**

6. **Processing can enhance the texture, flavor, and appearance of food.**

7. **Processed foods can be high in refined sugars and unhealthy fats.**

8. **Fortification allows processed foods to have higher levels of certain nutrients.**

9. **Food packaging accounts for roughly two-thirds (by volume) of total U.S. packaging waste.**

10. Some processed food packaging contains BPA, a chemical that has been linked to cardiovascular disease, certain cancers, and changes to immune system function.

11. Many processed foods are designed to be eaten anywhere, at any time, with little or no preparation.

12. In addition to producing a variety of flavors and textures, fermentation can promote gut health, preserve foods, improve nutritional quality, and reduce cooking times.

Lesson 10

Decoding Food Labels

[Lesson Duration: 50 minutes]

National Education Standards Alignment

- Social Studies
- Health
- FACS

Lesson Overview

Food products are labeled with words like “natural” and “humane,” and some are certified as USDA Organic or gluten free. Students will learn how to read and critically interpret common food labels, review who regulates and verifies the accuracy of these labels, and create their own food labels.

Learning Objectives

- Explore the common types of food labels and how to interpret them.
- Identify who regulates and verifies the accuracy of food labels.

Essential Questions

- What should consumers know about their food?
- How can consumers tell whether a food label is trustworthy?
- How could food labeling be improved?

Materials

- Flipchart paper or poster board
- Markers
- Sample food labels (provided)
- Presentation slides
- Teacher guide
- FoodSpan Infographic

Resources

- *Food Marketing and Labeling* primer (www.foodsystemprimer.org/food-and-nutrition/food-marketing-and-labeling/)

Warm-up: What Don't You Know About Your Food?

Social Studies, Health
[10 minutes]

Help students brainstorm a list of all the information they would ideally like to know about their food before buying it. Ask: *What don't you know about the food you eat?* For example, what dairy products are in the orange powder from boxed macaroni and cheese? What parts of the animal make up a hot dog? Can breakfast cereal really "support your child's immunity?" Explain that food labels are one way we get this information, but they can be hard to interpret and sometimes misleading.

Tape each ***Sample Food Label*** onto a piece of ***flipchart paper*** and post them around the room. Have students examine each label and mark the flipchart paper with a checkmark (trust), question mark (uncertain), or "x" (mistrust) to indicate their level of trust in that label. As a class, discuss:

- *What is this label telling you or not telling you?*
- *Why is this label trustworthy or untrustworthy?*
- *Does this label help answer any of the questions you had about what is in your food?*

Main Activity: Decoding Food Labels

Social Studies, Health, FACS
[15 minutes]

Students will explore which labels on food packages are regulated, which are trustworthy, and which are used as marketing tools. Ask: *What information about food should companies be required to show on a package?* This could be nutrition information (e.g., calories per serving), where the food was produced, etc. List their responses on the board.

Ask: *How do we know which food labels are trustworthy?* Explain that some people may assume everything on food labels is regulated, but that is not always the case. Many labels are misleading and are used to market products rather than inform consumers.

Display the ***slides***. Guide students through the types of food labels and information the government requires using the ***Slides Teacher Guide***. Discuss:

- *Do the food labels required by the government offer enough information about your food? If not, what information is missing?*
- *Which food labels are most trustworthy? How do you know?*
- *Which labels look misleading? Why?*
- *Are there any food label claims the government should regulate more strictly? Why or why not?*

Main Activity: Create Your Own Food Label

Social Studies, Health

[20 minutes]

Have students form groups and assign each group one of the following food types: breakfast cereal, energy bar, soup, beverage, frozen dinner, canned fruit/vegetable, packaged snack, bread or baked good, salad dressing, or pasta. Using ***markers*** and ***flipchart paper*** or ***poster board***, each group will design the packaging for its product, which may include:

- Name of the product
- Quality claims (e.g., triple-washed, fresh)
- Animal welfare or environmental claims (e.g., dolphin-safe)
- Nutrition claims (e.g., no trans fat, fortified with iron)
- Health claims (e.g., boosts immunity)
- Social justice claims (e.g., fair trade)
- Factors differentiating product from competition (e.g., 50% less sugar)

Each group will pitch their product to the class. After each group presents, ask the class:

- *Which label claim do you think is the least trustworthy, and why? Which is the most trustworthy?*
- *Does the package and its label claims make you want to buy the product? Why or why not?*

Wrap-up: Why is Food Labeling Important to Me?

[5 minutes]

Have students write a journal entry in response to the prompt: *Why is food labeling important to me as a consumer? How does it affect me?* Optional: Have students share their responses.

> *"By [Kellogg's] logic, you can spray vitamins on a pile of leaves, and it will boost immunity."*
>
> –Kelly Brownell, epidemiologist and obesity expert

Kellogg's has been criticized for making controversial label claims about its products. In 2009, a claim about boosting immunity (pictured) was discontinued after public health advocates challenged its validity.

Share Your Knowledge: *Ask students to share what they've learned by tweeting tips for interpreting food labels. Tag* **#foodlabelfacts** *and* **#foodspan** *to join the conversation.*

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food labeling. Ask: *Do these accurately and fully represent what we learned about food labeling? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Food Labels PSA Project
(Social Studies, Health)

Students will create public service announcements (PSAs)—in poster, booklet, video, or other form—on how to critically assess claims on food labels. PSAs will offer at least three pieces of information about how to interpret food labels and find reliable information. Encourage students to share their PSAs on social media using #foodspan and #foodlabelfacts.

Food Labeling History Project
(Social Studies, Health, ELA)

Students will research the history of a specific food label, such as USDA Organic, gluten free, or kosher. In a two- to three-page report, students will answer these questions: *Why was the label created? What standards does the label uphold? On what foods does this label appear? Are there critiques of the label? Does the label provide useful, credible information? Could this label be improved?*

Food Label Tracking
(Social Studies, Health)

Students will track the kinds of claims they find on food labels throughout a week, keeping a journal with the following information:

- Name of the product
- Quality claims (e.g., triple-washed, fresh)
- Animal welfare or environmental claims (e.g., dolphin-safe)
- Nutrition claims (e.g., no trans fat, fortified with iron)
- Health claims (e.g., boosts immunity)
- Social justice claims (e.g., fair trade)
- Factors differentiating product from competition (e.g., 50% less sugar)

Students should include claims from at least five foods or drinks, and note which ones they found most and least trustworthy, and why.

Sample Food Labels

Photo credit (fish fillets): Quim Gil, 2010. Flickr. Creative Commons CC BY-SA 2.0.

Photo credit (other labels): CarrotNewYork.

Slides Teacher Guide

For each of the sample food labels, ask: *What do you think this label tells us? Do you look for this label (or specific information provided on the label) when you buy or eat food? How does this information affect your food choices?*

Nutrition Facts

- Federal law requires certain foods to bear this label. While it is up to the food companies to accurately list **nutrient** content and ingredients, the government performs random tests to verify that companies are following the rules and regulations.

Ingredients

- This list is always found near the nutrition label.
- Items in the ingredients list must be listed in descending order by weight. For example, the first ingredient listed on a box of corn flakes is milled corn.

USDA Organic

- This label means the food was mostly produced without **pesticides** or synthetic fertilizers.
- The **U.S. Department of Agriculture (USDA)** sets rules for the methods and materials allowable under the label. For example, these rules generally prohibit the use of pesticides and synthetic fertilizers on certified organic farmland. To use the organic label, food manufacturers must use a certain percentage of organic ingredients. USDA-accredited organizations verify whether farms and other businesses follow the rules.[1]

Natural

- As of 2015, according to **U.S. Food and Drug Administration (FDA**) standards, the term "natural" means that no artificial colors, flavors, or other synthetic ingredients have been added.[2] These FDA standards are not enforced. The USDA, however, does regulate the use of the natural label on meat and poultry products.[3]

Third-party labels

- Some food label claims may be misleading. Labels such as "free range," for example, may imply that hens are raised outdoors, whereas the reality may be that they have only limited access to a small outdoor area.
- Looking for claims that have been certified by a third-party organization is a step in the right direction for consumers. Some of these certifiers have websites or contact information. The label pictured here shows the "Certified Humane" logo, as well as the certifiers website.

1. USDA Agricultural Marketing Service. *Organic Regulations*. Available at: https://www.ams.usda.gov/rules-regulations/organic
2. FDA. *"Natural" on Food Labeling.* 2016. Available at: http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/LabelingNutrition/ucm456090.htm
3. USDA Food Safety Inspection Service. *Food Standards and Labeling Policy Book*. 2005. Available at: http://www.fsis.usda.gov/wps/wcm/connect/7c48be3e-e516-4ccf-a2d5-b95a128f04ae/Labeling-Policy-Book.pdf?MOD=AJPERES

Lesson 11

Marketing: Under the Influence

[Lesson Duration: 50 minutes, plus 15 optional minutes]

National Education Standards Alignment

- Social Studies
- Health

Lesson Overview

The typical American child saw an estimated 4,787 televised advertisements for food and beverages in 2013—over 13 per day. Fast food was advertised more than any other product.[1] Students will examine how food companies market their products, explore the impact of **food marketing** on individuals' choices, and discuss how food marketing should be regulated.

Learning Objectives

- Examine common food marketing strategies.
- Describe how food marketing influences food choices.
- Critically consider if and how food marketing should be regulated.

Essential Questions

- How do food companies market their products?
- How does food marketing affect food choices?
- How should food marketing be regulated, if at all?

Materials

- Student handout
- Presentation slides
- Teacher guides
- FoodSpan Infographic
- Optional: Magazines and newspapers containing food ads

Resources

- *Food Marketing and Labeling* primer (www.foodsystemprimer.org/food-and-nutrition/food-marketing-and-labeling/)

Teacher Note: *The* **Take a Stand and Why Do We Eat What We Eat?** *activities in Lesson 12 can help students start thinking about influences on food choice, including food marketing.*

Warm-up:
Brand Recognition and Food Marketing Overview

Social Studies
[10 minutes]

To demonstrate the power of **advertising**, students will test their brand recognition. They will also learn the definition of food marketing.

Display the ***Brand Recognition slides*** and challenge students to identify as many companies or products as they can in two minutes. Use the ***Brand Recognition Teacher Guide*** to reveal the answers. Discuss:

- *Where do you see this logo, and how often?*
- *Do you think your recognition of this logo affects your food choices? If so, how and why?*
- *Which logo is the most recognizable? Why?*

Explain that when given a choice between comparable products, consumers typically choose the brand they recognize.[2] Ask: *What does this tell us about the power of advertising?*

Explain that building brand recognition is one of many marketing tactics. Provide a definition of food marketing: the activities involved in distributing, promoting, and selling a food product. Ask: *Imagine that you are a marketing director for a food company. What tactics would you use to increase sales of your products?* If students need prompting, explain that marketing includes:

- Advertising
- Building relationships with customers
- Developing "new and improved" versions of products
- Designing attractive packaging and labeling
- Attracting celebrity endorsements
- Paying stores for prominent shelf space

"We may believe that we make informed decisions about food choice, but we cannot do so if we are oblivious of the ways food companies influence our choices."

– Marion Nestle

Teacher Note: *Students may conflate marketing with advertising. Remember that marketing is the overall strategy of distributing, promoting, and selling a product, whereas advertising is a form of communication used to persuade people to buy a particular product.*

Main Activity: Analyzing Ads

Social Studies [20 minutes]

To deepen their understanding of corporate food marketing tactics, students will analyze food advertisements. Divide the class into small groups. Assign each group one of the following food categories:

- Breakfast foods
- Soda
- Juice
- Fast food
- Meat
- Candy/snacks
- Vegetables
- Dairy
- Fruit

Instruct each group to research several advertisements promoting products in their selected category. For example, a group assigned to breakfast foods might find ads for Kellogg's cereals, Quaker Oats, or McDonald's breakfast sandwiches. Groups may look through newspapers, magazines, or websites, such as food commercial compilations on YouTube.

Have each group choose one ad and present it to the class, answering these questions:

- *What is the product being advertised?*
- *What type of ad is this (e.g., TV commercial, magazine, Internet)?*
- *Why would the company choose this type of ad?*
- *What methods does the company use to draw attention to its product (e.g., loud music and bright lights, a likable cartoon character, or a celebrity endorsement)?*
- *Who is the target audience for the ad?*
- *Why do you think the ad might be successful?*
- *How, if at all, would you modify this ad to make it more effective?*

After groups present, discuss: *Which products are most often the subject of advertising campaigns? Why?* (Refer to the ***Food Marketing and Labeling primer*** for an explanation.) Then display and discuss the ***Food Advertising Spending slide***, which shows how much money is spent advertising different foods and beverages in the U.S.

Placing candy and other tempting products at the cash register, a strategy called "impulse marketing," is designed to encourage spur-of-the-moment purchases.

Photo credit: Brian Costin, 2008. Flickr. Creative Commons CC BY-NC-SA 2.0.

Most children under 8 years of age are developmentally unable to understand that the purpose of commercials is to persuade them to buy products.

Photo copyright.

Main Activity: Trivia Game: Food Marketing in Action

Social Studies, Health
[15 minutes]

Students will play a trivia game covering three topics: Brand Recognition, Influence of Ads, and Advertising Tactics. Questions have three point values (10, 20, and 30) and are available in the ***Trivia Game Teacher Guide***. Write the categories and point values in a *Jeopardy*-like style on the board or a flipchart. Some categories have follow-up questions for discussion.

Divide students into 3-5 teams. Team A takes the first turn at selecting a category and point value and has the first chance to answer the question. If they answer incorrectly, other teams may raise their hands to answer. The team that gives the correct answer is awarded the points. Regardless of the outcome of that question, Team B selects the next category and point value, and so on. Keep track of the points on the board. Continue until all questions are answered or time runs out.

Discuss:

- *What fact about food marketing surprised you the most? Why?*
- *How does marketing influence what people eat?*
- *Has this activity changed how you think about marketing?*

Optional Activity: Debate: Marketing Soda in Schools

Social Studies, Health
[15 minutes]

Divide students into three groups and distribute the ***Soda Ban Case Study Handout*** about the California ban on soda in public schools. Have all groups read the handout. Instruct Group One to prepare an argument supporting the ban, and Group Two to prepare an argument opposing it. Each group will present its argument to Group Three, the jury. Each member of Groups One and Two will present at least one statement to support their group's case. After hearing from both sides, each juror will decide which group has presented the stronger argument and write 2-3 sentences justifying their position. Count the jury's votes and reveal the results.

Share Your Knowledge: *Have students share what they've learned by tweeting the most striking food marketing fact from the trivia game. What should others know about food marketing? Tag* **#foodmarketingfacts** *and* **#foodspan**.

Wrap-up: Regulating Food Marketing

[5 minutes]

Students will write a journal entry in response to this prompt: *How should food marketing be regulated, and why?* Optional: Have students share their responses.

Extensions:

Revisiting the Infographic *(Social Studies)*

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food marketing. Ask: *Do these accurately and fully represent what we learned about food marketing? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Healthy Food Marketing Campaign *(Social Studies, Health, ELA)*

Students will work in groups to design a marketing campaign for a healthy food in their school. Challenge students to consider how they would measure the impact of their campaign on consumption of their target food. Students can watch a 2010 Canadian broccoli campaign as an example of healthy food marketing: www.adweek.com/adfreak/tv-spots-fool-canadians-eating-broccoli-12161 and https://studylib.net/doc/9204193/tvb.ca-broccolicase-broccolipresentationr3. Encourage students to share their campaigns on social media using #foodspan.

Advertising Awareness Experiment *(Social Studies)*

Students will track the number of times and places they see and hear food advertisements every day for a week. Students will write a reflection or give a presentation on their findings, offering details about the type of ads, where they saw the ads, what foods were advertised, the time of day they saw or heard the ads, and how many times they saw or heard them.

Food Marketing History Project *(Social Studies)*

Students will conduct a research project examining the marketing history of a food product of their choosing. Each student will describe how and why the company's marketing strategy evolved over time, and which tactics were successful.

1. Dembek CR, Harris JL, Schwartz MB. *Trends in Television Food Advertising to Young People: 2013 Update.* Yale Rudd Center; 2014.
2. Macdonald EK, Sharp BM. Brand awareness effects on consumer decision making for a common, repeat purchase product: a replication. *J Bus Res.* 2000;48:5-15.

Brand Recognition Teacher Guide

a. Coca-Cola

b. Taco Bell

c. McDonald's

d. Pizza Hut

e. Burger King

f. Subway

g. Starbucks

h. Dunkin' Donuts

i. Gatorade

j. Little Debbie

k. Sprite

l. KFC

Trivia Game Teacher Guide

Brand Recognition

10 points: What is the most profitable soda brand in the world?

Answer: Coca-Cola is by far the most profitable soda brand in the world, making more money than Pepsi, Dr. Pepper, Sprite, and Fanta combined.[1] (Note: Sprite and Fanta are both brands of the Coca-Cola Company.)

Discuss: *Why do you think Coca-Cola is so successful?*

Possible answers: Coca-Cola has a massive year-round marketing campaign that includes special holiday ads, novel marketing techniques such as adding people's names to bottles, and a wide variety of products that feature the company logo and mascots (such as the polar bears).

20 points: Name two food products that feature a cartoon character in their ads or on their packaging.

Possible answer: Many cereals such as Frosted Flakes (Tony the Tiger), Cap'n Crunch (Cap'n), and Rice Krispies (Snap, Crackle, and Pop), use cartoon characters.

Discuss: *Why do companies use cartoon characters in their marketing?*

Answer: Children respond more favorably to foods that use popular cartoon characters. In one study, twice as many children preferred the taste of foods that had cartoon characters on the package, compared to those who preferred the same foods from a plain package.[2]

30 points: Name two cartoon mascots that appear in ads for vegetables, fruits, or nuts.

Possible answers: The Jolly Green Giant, the Sun-Maid Raisins girl, the California Raisins, the Vlasic Stork (pickles), and Mr. Peanut.

Discuss: *Generally, companies spend less money marketing fruits, vegetables, and other less-processed foods, and are less likely to use marketing tools like mascots. Why is this?*

Possible answers: Processed foods typically have a higher profit margin than raw produce. Processing is said to add value to products because consumers are willing to pay more for a food with added convenience, longer **shelf life**, or enhanced flavors or appearances, for example. Many fruits and vegetables, by contrast, are limited to being frozen, canned, peeled, sliced, pre-washed, or sold raw—meaning they have less potential for adding value.

Influence of Ads

10 points: In a 2006 study, people were shown different brands while their brains were hooked up to an MRI.[3] Seeing the most well-known brands activated parts of the brain associated with which of the following? A) Reward, B) Positive emotions, C) Self-identity, D) All of the above.

Answer: D.

20 points: In 2010, the Television Bureau of Canada launched an advertising campaign featuring broccoli, "the Miracle Food." Following the campaign, broccoli sales A) increased, B) decreased, C) stayed the same.

Answer: A. broccoli sales increased by 8 percent, while consumers' perceptions of broccoli as a tasty and healthy food rose substantially.[4] This campaign demonstrated that advertising can be used to promote healthy foods.

30 points: At what age do children become able to understand that the purpose of commercials is to persuade them to buy products? A) Age 4, B) Age 6, C) Age 8, D) Age 10.

Answer: C. Research has shown that children younger than 8 are developmentally unable to understand that the purpose of commercials is to persuade people to buy products and frequently accept advertising claims as true statements.[5]

Discuss: *How, if at all, should governments restrict advertising to children?*

Advertising Tactics

10 points: Successful marketing often involves developing unique products. For every successful new product, there are countless failures. Which of the following real products was not a market failure? A) Life Savers soda, B) Greek yogurt, C) Pepsi A.M. (the breakfast cola), D) Colgate brand frozen entrées.

Answer: B.

20 points: Placing candy and other tempting products at the cash register is designed to encourage spur-of-the-moment purchases. This tactic is called: A) Impulse marketing, B) Drip marketing, C) Niche marketing, D) Ambush marketing.

Answer: A. Food manufacturers frequently pay "slotting fees" to place their products on the most visible areas of supermarket shelves, where consumers are more likely to notice them. Placing products in prominent locations can increase their sales by as much as fivefold.[6]

30 points: What is the main reason companies sell sodas and other products in schools?

Answer: To build brand loyalty. Company representatives have admitted that selling their products in schools is only marginally profitable, but they benefit from recruiting lifelong customers at a young age. This approach is based on the theory that the younger the age at which brand awareness is established, the stronger the brand loyalty will be as a child grows and the more money they will spend on those products.[7]

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1. Millward Brown. Brandz: Top 100 Most Valuable Global Brands 2015. https://www.forbes.com/the-worlds-most-valuable-brands/#5b5ffeab119c.
2. Roberto C, Baik J, Harris JL, Brownell KD. Influence of licensed characters on children's taste and snack preferences. *Pediatrics*. 2010;126(1):88-93.
3. Radiological Society of North America. MRI shows brains respond better to name brands. 2006. http://www.eurekalert.org/pub_releases/2006-11/rson-msb112106.php.
4. Television Bureau of Canada. The Miracle Food. 2010.
5. Shifrin DL, Brown A, Dreyer BP, et al. Children, adolescents, and advertising. *Pediatrics*. 2006;118(6):2563-2569.
6. Cohen DA, Babey SH. Candy at the cash register - a risk factor for obesity and chronic disease. *N Engl J Med*. 2012;367(15):1381-1383. doi:10.1056/NEJMp1209443.
7. Connor SM. Food-related advertising on preschool television: building brand recognition in young viewers. *Pediatrics*. 2006;118(4):1478-1485. doi:10.1542/peds.2005-2837.

Soda Ban Case Study Handout

Instructions: Use this case study about the soda ban in California schools to develop your argument for or against the ban. Each member of your group should present at least one fact, statement, or point from the case study to defend your group's position.

In 2005, the state of California began requiring elementary and middle schools to stop offering soda as a cafeteria option and to prohibit sodas in school vending machines.[8] A year later, the ban was expanded to include high schools. The ban was designed to encourage students to make healthier choices during school hours.[9]

The governor at the time, Arnold Schwarzenegger, was a firm supporter of the bill, as were the majority of California's lawmakers. Gov. Schwarzenegger didn't just want to ban sodas; he also wanted to promote healthier choices. To that end, he signed another bill that provided funding for more fruits and vegetables in school food programs.

As a 2006 California Endowment report states, "The problem [of obesity] was particularly disturbing in children, one-third of whom are overweight and one-seventh of whom are obese. The causes of what some considered to be an obesity epidemic were not hard to discover: people were eating more food, much of it unhealthy, and getting less physical activity."[8]

Soda in particular was a major issue, since a child's risk for obesity increases by almost 60 percent with every additional daily serving of soda.[10] Banning sodas in schools was one way legislators saw to help stem the tide of unhealthy habits.

However, banning only soda, and not other sugar-sweetened beverages such as juice and energy drinks, may not actually improve student health. According to one recent study: "States that only ban soda, while allowing other beverages with added caloric sweeteners, appear to be no more successful at reducing adolescents' [sugar-sweetened beverage] access and purchasing within school than states that take no action at all."[11]

Because of these findings, some argue that we should allow sodas so cash-strapped schools can use the sales revenue to fund sports, arts, science, health, and other programs. One California school brought in as much as $58,000 a year on a Pepsi contract before the bans began.[12]

So the question remains, should schools ban sodas?

8. Isaacs S, Swartz A. *Banning Junk Food and Soda Sales in The State's Public Schools.* The California Endowment. 2006.
9. Fudge T. *California Bans Soda in Schools*. KPBS Public Media, 1 July 2009.
10. Johnson R, Appel L, Brands M, et al. Dietary Sugars Intake and Cardiovascular Health: A Scientific Statement From the American Heart Association. *Circulation*. 2009;120(11):1011-1020.
11. Taber DR, Chriqui JF, Powell LM, Chaloupka FJ. Banning all sugar-sweetened beverages in middle schools: reduction of in-school access and purchasing but not overall consumption. *Arch Pediatr Adolesc Med.* 2012;166(3):256-262.
12. Kuznia R. *Soda Bans Cost South Bay Schools Thousands of Dollars*. The Daily Breeze, 11 Aug. 2012.

Lesson 12

Why We Eat What We Eat

[Lesson Duration: 55 minutes, plus 15 optional minutes]

National Education Standards Alignment

- Social Studies
- FACS
- Health

Lesson Overview

Many factors contribute to a person's food choices, from geographic location to culture to socioeconomic status. Students will explore the many external factors that affect why we eat what we eat

Learning Objectives

- Explain what a **food environment** is.
- Analyze how food environments influence food choices.
- Identify how changing food environments could promote healthier diets.

Essential Questions

- Why do we eat what we eat and why does it matter?
- How much are individuals responsible for their own food choices?
- How can we promote healthier food environments?

Materials

- Student handouts
- Presentation slides
- Dietary Change Signs
- FoodSpan Infographic
- Optional: Tape

Resources

- *Diet and Health* primer (www.foodsystemprimer.org/food-and-nutrition/diet-and-health/)
- *Food Environments* primer (www.foodsystemprimer.org/food-and-nutrition/food-environments/)

Warm-up:
Take a Stand: Diet & Choice

[5 minutes]

Label opposite ends of the classroom with signs that say Agree and Disagree. Pose the statement: "Individuals are responsible for their own food choices." Have students go to the side of the room that represents their opinion. Undecided students may stand in the middle of the room. Ask for volunteers to justify their position.

Ask: *If individuals are not fully responsible for their food choices, who or what is? Students will revisit this question later in the lesson.*

This activity can be repeated at the end of this lesson to explore how students' views may have changed.

Main Activity:
What Does Healthy Eating Look Like?

Health, FACS

[15 minutes]

Display the ***Healthy Eating Plate slide*** and distribute the ***Blank Healthy Plate Handout***. Ask for volunteers to briefly summarize the healthy plate model. Then instruct students to use this model to draw or describe a healthy lunch: a meal that provides your body with the nutrients it needs for growth, maintenance, and repair; supplies energy for daily activities; and reduces the risk of illness. Then ask volunteers to share their illustrations and encourage others to provide feedback. Ask: *Is this meal complete? What is missing? What is excessive? What barriers prevent people from eating healthy meals?*

Why do we eat what we eat?

Photo copyright.

Is this what healthy eating looks like?

Photo credit: MIa Cellucci, CLF.

Teacher Note: *Students might only think of meat when considering protein sources. Remind them to also consider plant-based proteins such as beans.*

Main Activity: Why Do We Eat What We Eat?

Social Studies, Health, FACS
[10 minutes]

Students will explore factors that influence food choices. Explain that although we may know what constitutes a healthy diet, our environment may not support healthy eating. Distribute the ***Influences on Food Choice Handout***. Ask: *Why do we eat what we eat?* List students' responses on the board and group them using the categories on the handout. Have students take notes on their handouts. Refer to the ***Influences on Food Choice Teacher Guide*** for examples.

Explain that our food choices are influenced by factors such as taste preferences and knowledge (individual factors), people and culture (social environment), food availability and food marketing (physical environment), and government policies (policy environment). For the rest of the lesson, students will focus on the outer three circles, which constitute the **food environment**.

Main Activity: Food Environment Scenarios

Social Studies, Health, FACS
[10 minutes]

Distribute the ***Food Environments Handout*** and have students work in pairs to analyze two food environment scenarios. As a class, discuss: What kind of meals would John and Lydia eat? What barriers might prevent them from eating healthy meals? *What are the differences between the two food environments? What could be done to improve each food environment?*

Main Activity: Assessing the Food Environment at School

Social Studies, Health, FACS
[10 minutes]

Ask students to describe the food environment at their school, using these questions as a guide:

- *What foods are prepared through the school lunch program?*
- *Does your school have vending machines, and do they have healthy options?*
- *Does your school have vegetable gardens?*
- *Do students buy food from nearby stores or restaurants?*
- *What food advertisements do you see near your school?*

Working in small groups, have students brainstorm how changing their school's food environment could promote healthier diets.

Teacher Note: *Clarify that the word "environment" can refer not only to the natural world, but also to people, buildings, and other parts of our surroundings.*

Optional Activity: Changes in Health and Diet

Social Studies, Health, FACS
[15 minutes]

To understand how food choices and food environments have changed over time, students will identify major trends in U.S. eating habits. Display the ***American Diets slide***. Ask for student reactions: *What does this chart tell you about Americans' eating habits?*

Tape the four ***Dietary Change Signs*** around the room: Decreased, Increased by Up to 50%, Doubled, and More than Doubled. Call out the items and timespans below. For each item, ask students to move to the station they think most accurately represents how consumption of that item has changed in the U.S. over the timespan. After students have chosen their positions, reveal the information in the third column.

Discuss:

- Which dietary trend was most surprising to you?
- Do you or your friends and family try to avoid or monitor your intake of these foods?
- What might make it hard to avoid these foods?
- What do these statistics tell you about how food environments in the U.S. might have changed over the last few decades?

Wrap-up: Reflecting on Individual Choice

[5 minutes]

Revisit the question from the beginning of the lesson: *Are individuals responsible for their own food choices? Why or why not? Has your answer changed since the beginning of the lesson?* Optional: Have students share their responses.

> *"Eat food. Not too much. Mostly plants."*
>
> - Michael Pollan

Item	Timespan	Change
Calories	1970 - 2000	The average number of daily calories per capita in the U.S. food supply increased by over 500[1]—the equivalent of adding a quarter-pound cheeseburger, 365 days a year, to the diet of every U.S. citizen.
Sugar	1970 - 2010	Added sugar intake increased by 11 percent.[1] While this may not seem like a large increase, added sugar intake was already high in 1970 — as much as two 12-ounce cans of soda.
Soda	1950 - 2000	Soda consumption more than tripled, while milk consumption nearly halved.[2]
Snacks	1977 - 2006	Children's snack consumption doubled.[3] By 2006, nearly one-fifth of calories consumed by 2- to 18-year-olds were in the form of grain-based desserts, pizza, and soda.[4]
Fruits and vegetables	1970 - 2010	Vegetable intake increased by 12 percent and fresh fruit intake increased by 28 percent,[1] but the average American still falls short of dietary recommendations.

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the FoodSpan Infographic (students may already have their own from previous lessons). Ask students to identify parts that represent food environments. Ask: *Do these accurately and fully represent what we learned about food environments? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Food Environments in Film
(Health, Social Studies)

The Center for a Livable Future's original short film, *Food Frontiers* (36 minutes, www.foodspan.org/films/food-frontiers.html), showcases six projects from around the U.S. that are transforming food environments in ways that increase access to healthy food. A discussion guide is provided.

Alternatively, students can watch and analyze a film about trends in the American diet (e.g., *Supersize Me*, *Fed Up*) or a different film about food environments. Discuss: *What was most surprising about the film? What did it show you about Americans' eating habits and/or food environments, and how they could be improved?*

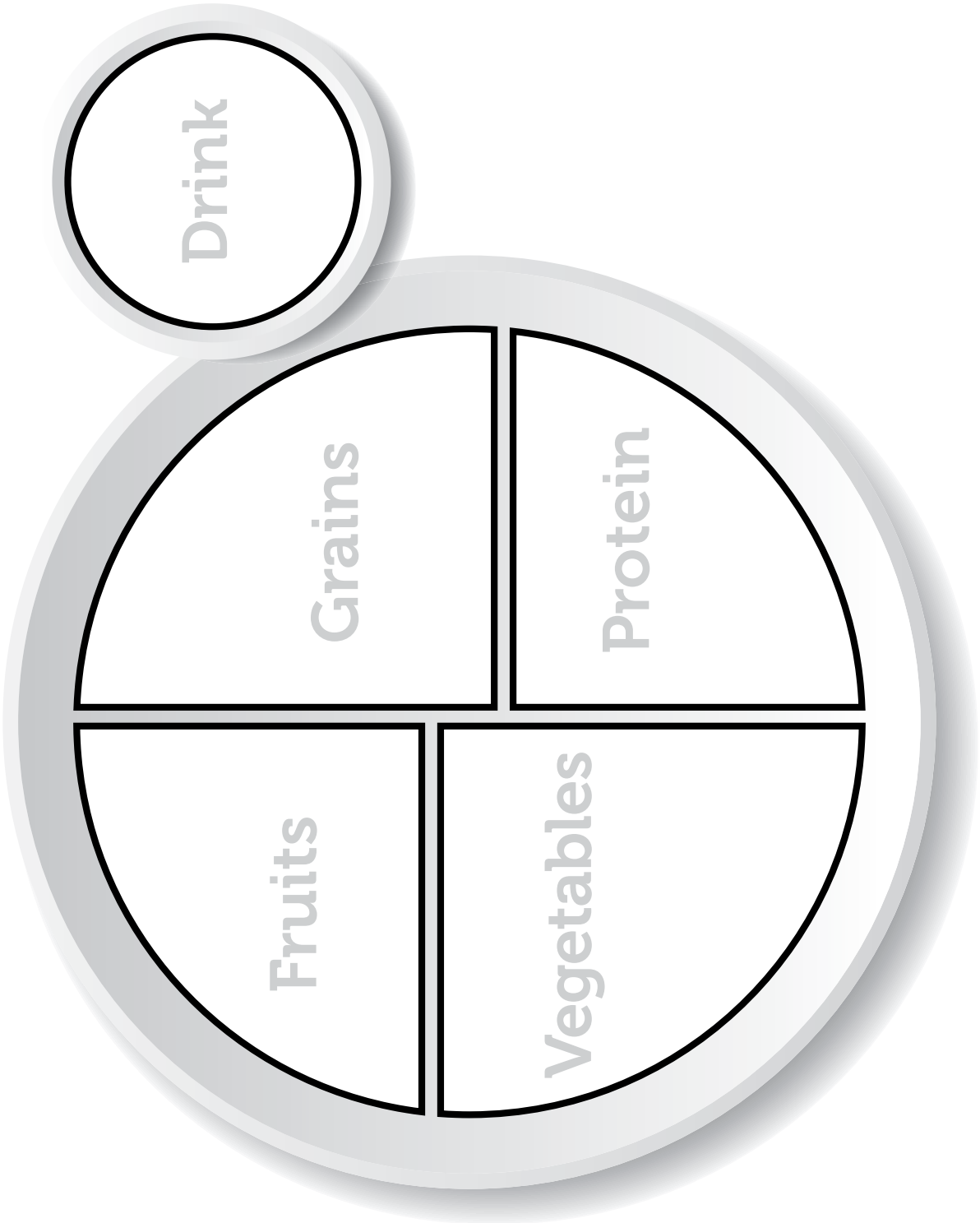
Community Food Mapping
(Social Studies)

Have students create maps of their own communities, noting all food sources (e.g., grocery stores, restaurants, farmers' markets, community gardens) and the distances between them and where people live. Students may additionally include information about sidewalks, bus routes, income levels, or any other features or data that may affect access to (or availability of) healthy food. Based on this information, have students write a paper or give a presentation about the food environment in their community. Students should make note of any additional information they would need to better measure and improve their food environment.

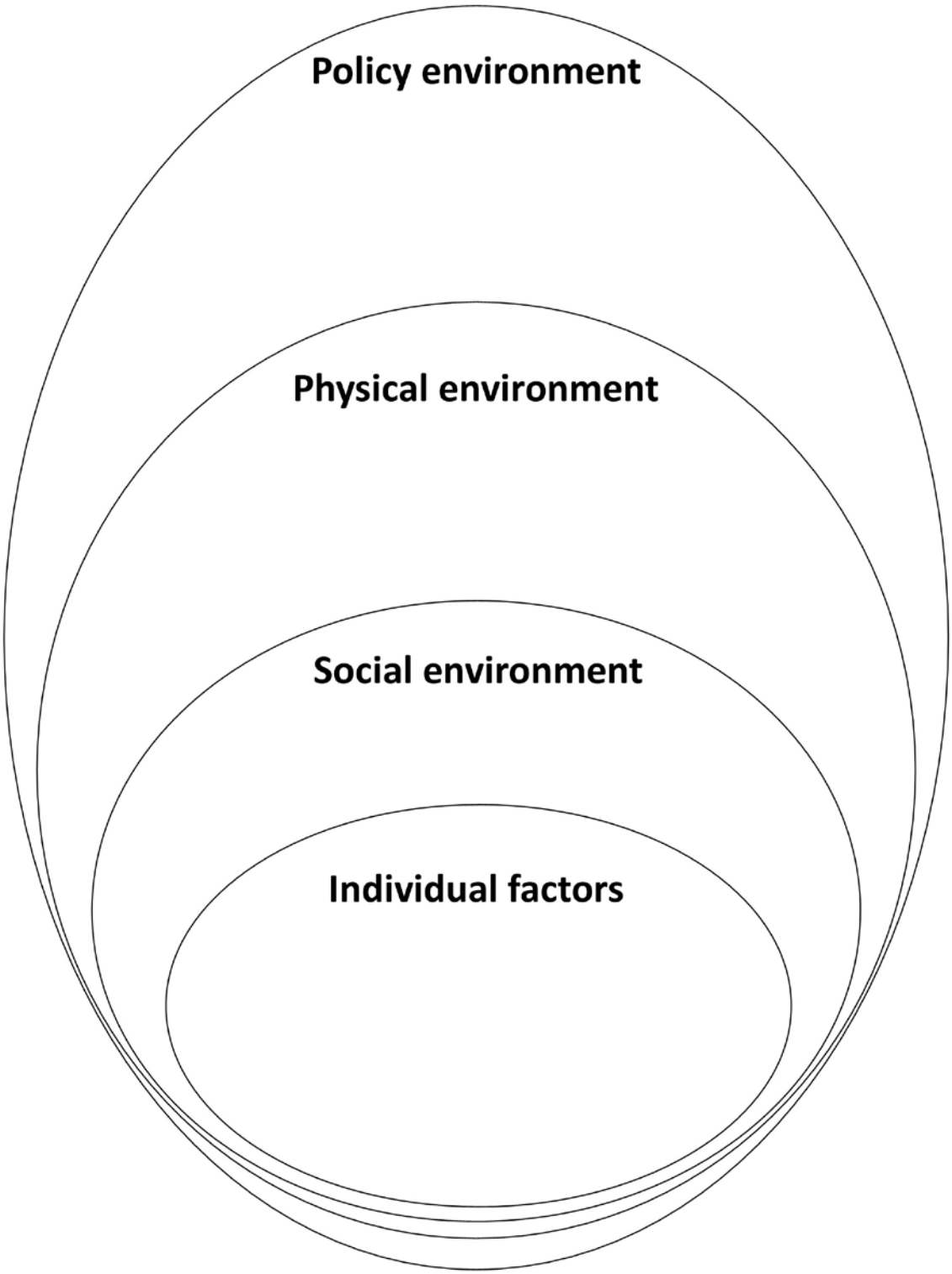
Share Your Knowledge: *How do food environments affect people's food choices? Ask students to tweet what they've learned and tag* **#foodenvironment** *and* **#foodspan** *to join the conversation.*

1. USDA Economic Research Service. Loss-Adjusted Food Availability. 2014.
2. USDA Economic Research Service. Food Availability (Per Capita) Data System. 2013.
3. Popkin BM, Duffey KJ. Does hunger and satiety drive eating anymore? Increasing eating occasions and decreasing time between eating occasions in the United States. Am J Clin Nutr. 2010;91(5):1342-1347.
4. Reedy J, Krebs-Smith S. Dietary sources of energy, solid fats and added sugars among children and adolescents in the United States. J Am Diet Assoc. 2010;110(110):1477-1784.

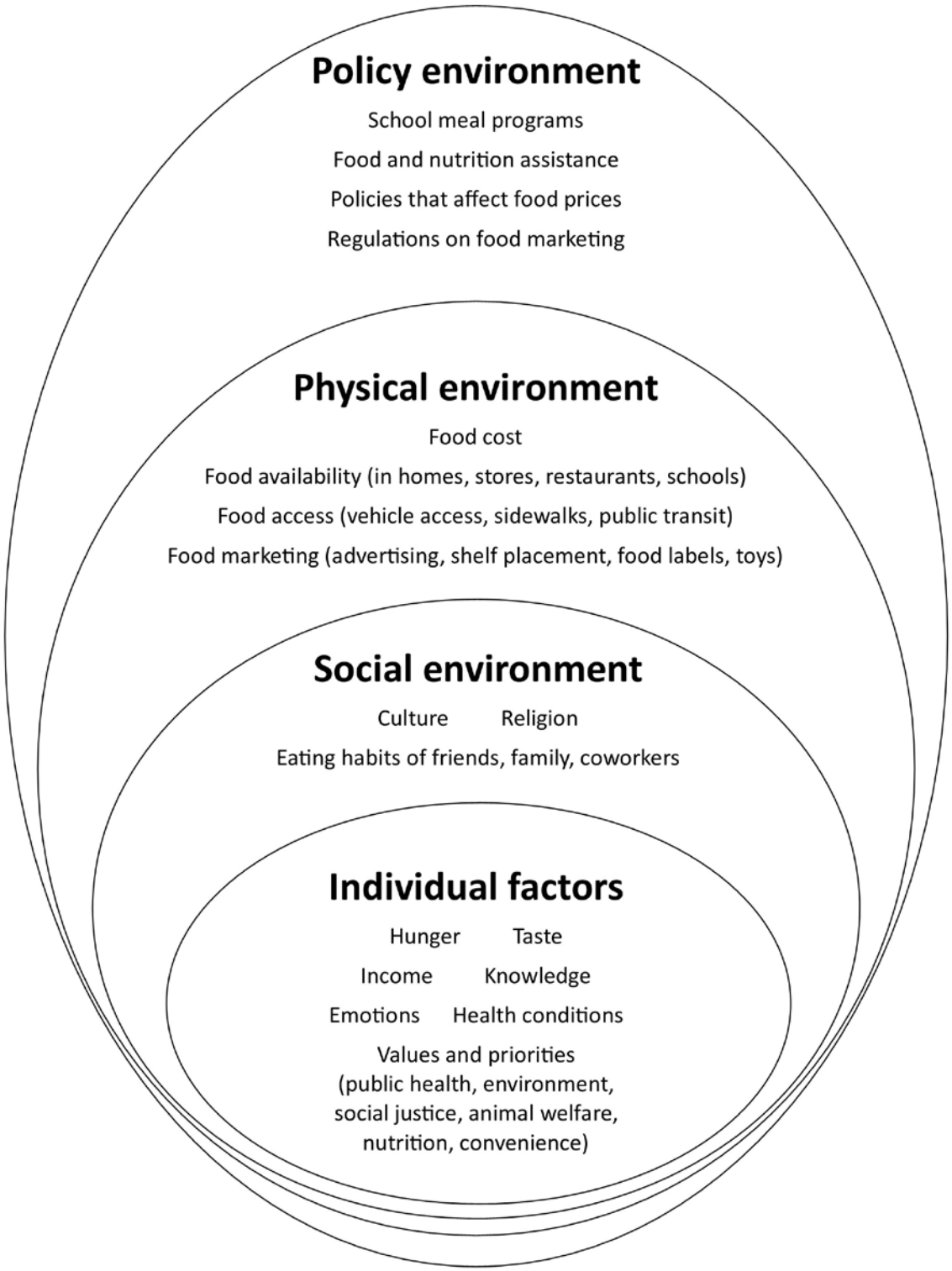
Blank Healthy Plate Handout



Influences on Food Choice Handout



Influences on Food Choice Teacher Guide

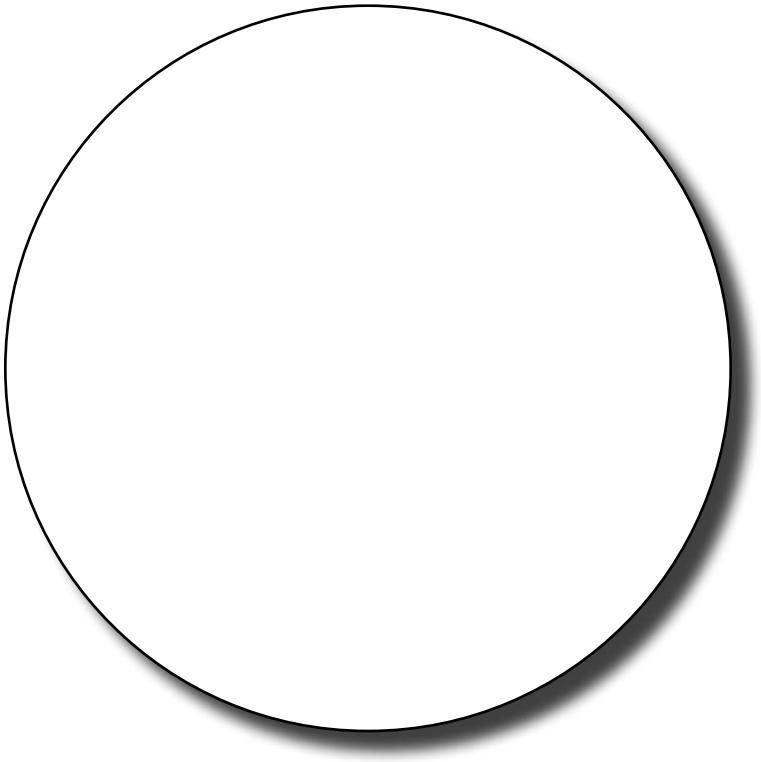


Food Environments Handout

John's Food Environment

John lives near a small town in a rural farming community. His parents produce and sell vegetables on their family farm, and they raise chickens to sell eggs. They sell their produce at several farmers' markets in nearby towns. John's parents do not have a large income, and they produce as much of their own food as possible. When their food supplies run out, they must drive 30 miles to a general store that has limited options.

What would John eat for dinner?
Draw or describe what might be on John's dinner plate:



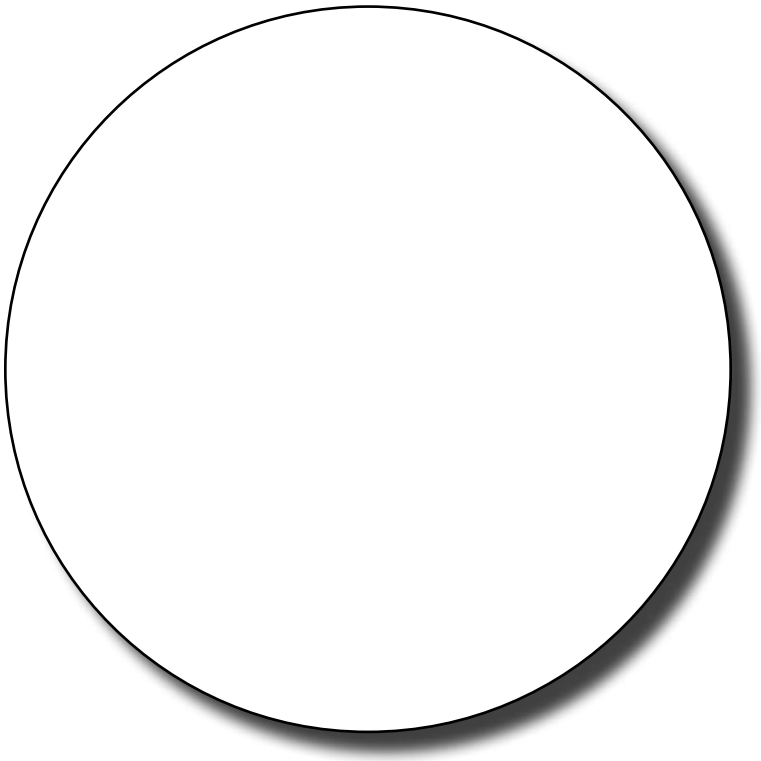
Why does John eat what he eats?
Give examples of how John's social and physical environment might affect his food choices:

Social environment	Physical environment

Lydia's Food Environment

Lydia and her family, immigrants from Central America, live in a large city. Her parents are rarely home from work in time for dinner, so Lydia often eats alone in front of the television. Her father uses the family car to get to work, so Lydia stays within walking distance to get meals. Though her parents encourage her to eat fruits and vegetables, there is no grocery store near her family's apartment. There are a couple of corner stores, which sell microwavable snacks. Her friends often meet up to eat at the only nearby restaurant.

What would Lydia eat for dinner?
Draw or describe what might be on Lydia's dinner plate:

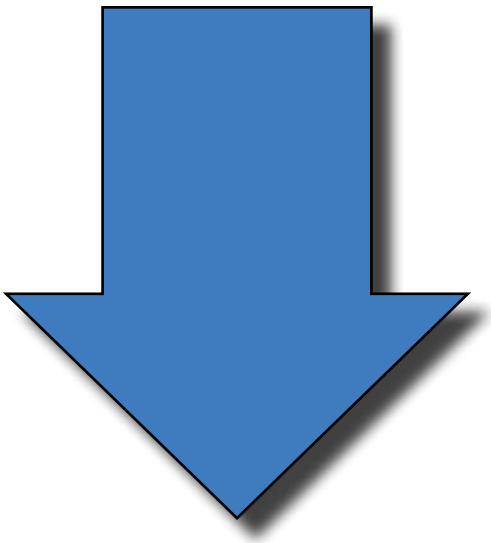


Why does Lydia eat what she eats?
Give examples of how Lydia's social and physical environment might affect her food choices:

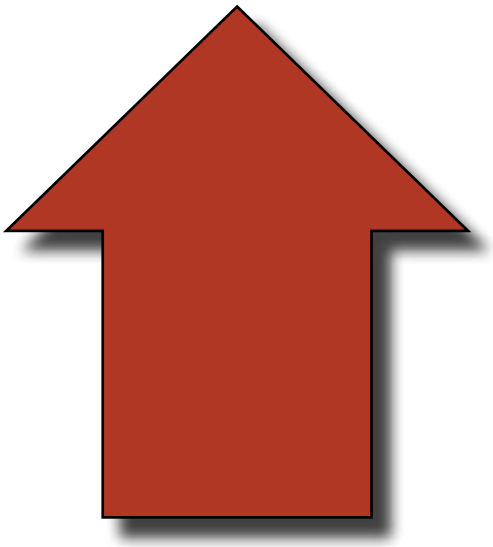
Social environment	Physical environment

Dietary Change Signs

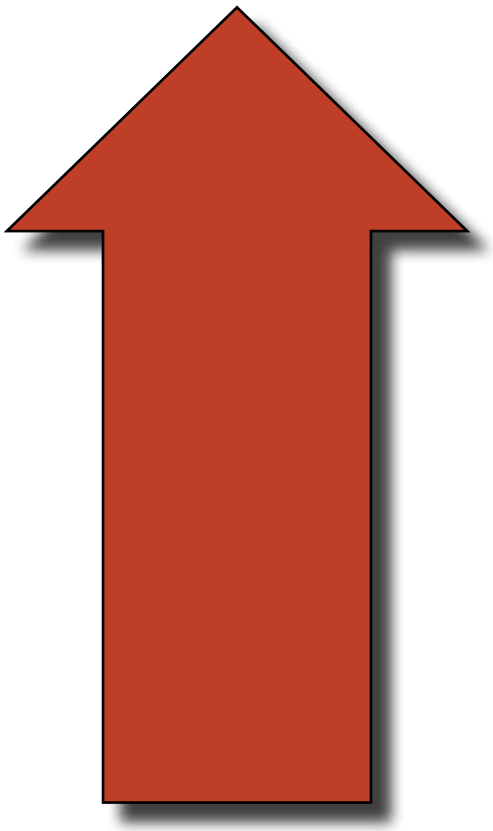
DECREASED



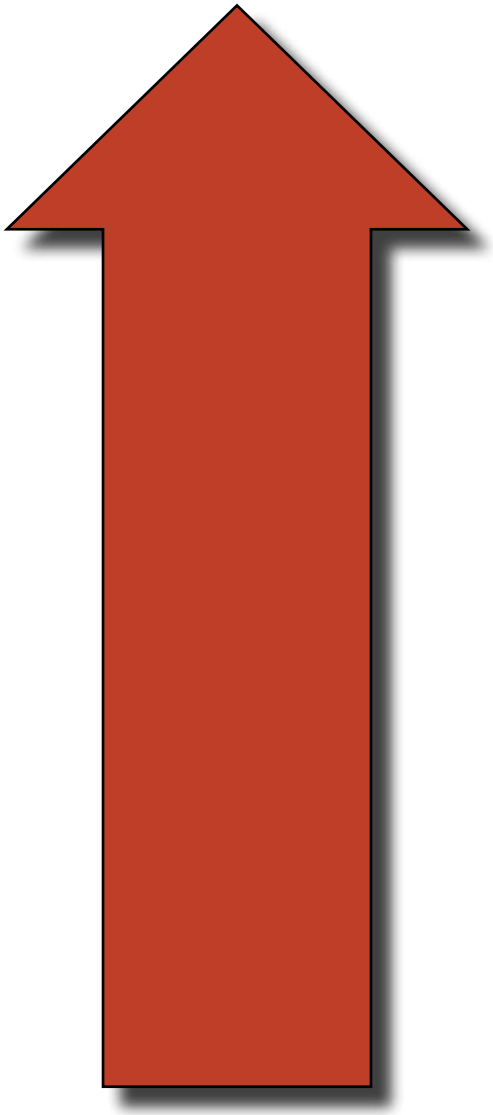
INCREASED BY UP TO 50%



DOUBLED



MORE THAN DOUBLED



Lesson 13

Our Wasted Food

[Lesson Duration: 50 minutes]

National Education Standards Alignment

- Social Studies
- Science

Lesson Overview

In the United States, as much as 40 percent of harvested food is never eaten.[1,2] Students will learn why food waste is a problem and explore strategies to reduce it. Extension projects will further empower students to take action to reduce food waste in their homes, schools, and communities.

Learning Objectives

- Explain why food waste is a problem.
- Describe what happens to food waste.
- Identify strategies to reduce food waste.

Essential Questions

- Why is wasting food a problem for public health and the environment?
- How can we reduce food waste?

Materials

- Presentation slides
- FoodSpan Infographic

Resources

- *Wasted Food* primer (www.foodsystemprimer.org/wasted-food/)

Warm-up:
The Problem of Food Waste

Social Studies
[15 minutes]

Ask students to reflect on the last three days and recall any time they threw out food. *What was the food? How much was thrown out? Why did they throw it out?* After students respond, share this statistic: An estimated 31 to 40 percent of all food harvested in the United States is never eaten.[1,2]

Ask: *Does this statistic surprise you? Where along the food supply chain do you think this food waste occurs?* Generate a list on the board that includes these steps in the supply chain:

- **Before Harvest:** Before food is harvested, crops may be lost to **pests** or bad weather, farmers might overestimate demand for a crop and plant more than they can sell, or there may be a shortage of farm workers to help with harvesting.[3]
- **After Harvest:** A large portion of produce is discarded because it does not meet consumers' expectations for size, shape, color, sweetness, or a flawless appearance.[3] Not all is wasted, as some is composted or fed to animals.
- **Processing:** When food is processed and packaged for sale, edible parts such as skin, peels, and fat may be trimmed and discarded. Again, not all is wasted, as some is used for purposes such as animal feed or soup stock.[3]
- **Grocery Stores:** Stores try to keep shelves bursting with food at all times to please their customers, even if it means stocking more food than they can sell before it spoils.[3]
- **Restaurants:** Restaurants tend to serve large portions, which consumers may not be able to finish in one sitting. On average, diners leave an estimated 17 percent of their meals uneaten.[3]
- **Retail and Consumption:** Stores and consumers regularly throw away food that has passed its "sell by," "best by," or "use by" date, including food that is perfectly edible. Contrary to what many consumers believe, expiration labels are manufacturers' recommendations for peak quality, and generally have nothing to do with **food safety**.[4]

To summarize, display the ***Waste by Food Group slide***, which shows the percentage of U.S. food waste from different sources. Ask: *What kinds of food are wasted most? Do these percentages surprise you? What does this tell you about the problem of food waste?*

Supermarkets may keep shelves bursting to please customers, even if it means stocking more food than they can sell before it spoils.

Photo credit : Bunny Hero, 2010. Flickr. Creative Commons CC BY-SA 2.0.

Restaurants tend to serve large portions. On average, diners leave an estimated 17 percent of their meals uneaten.

Photo credit: Mia Cellucci, CLF. Adapted from original.

Main Activity: Why Food Waste Matters

Science, Social Studies

[15 minutes]

Ask students to imagine they are walking through the woods eating an apple. When they get to the core they toss it into the woods. Ask: *What will happen to the apple core?* Then, display the ***Nutrient Cycle slide*** and explain the cycling of **organic matter** in nature: Decomposers in the soil break down the apple core and turn it into **nutrient**-rich material that can be used by other plants. Much of our food waste gets mixed with non-biodegradable waste and sent to landfills, and thus its nutrients are not restored to the soil.

Display the ***Landfills slide*** or write the following on the board: Food represents the single largest component (21%) of solid waste in landfills and incinerators.[5] Explain that the vast majority of food waste ends up in landfills or is incinerated (burned at high temperatures).[6] When food decomposes while buried in a landfill, it does so without oxygen and therefore generates methane, a **greenhouse gas** with at least 21 times the global warming potential of carbon dioxide. Ask: *What does this tell you about how food waste impacts humans and the environment? Why is food waste a problem? What should we do with food waste instead?*

Ask: *In addition to these environmental problems, what are other costs of wasting food?* Encourage students to think about all areas of the ***FoodSpan Infographic***. Write responses on the board. Answers can include:

- **Waste of agricultural inputs:** In the U.S., an estimated 25 percent of **freshwater** use, for example, is wasted producing food that is never eaten.[2] When food is discarded, animals are unnecessarily raised and slaughtered, **pesticides** are sprayed for no benefit, and land and labor is spent nourishing crops that never nourish people.
- **Waste of potential profit:** Discarding food also means throwing away money. Farmers miss opportunities to profit when fields go unharvested. Grocery stores and restaurants lose money each time foods they stock go unsold. The estimated value of food discarded by U.S. consumers and food stores alone was over $160 billion in 2010.[1]

Teacher Note: *Refer to Lesson 5 for more about climate change and its connection to food.*

Main Activity: Reducing Food Waste

Social Studies
[15 minutes]

Have students pair up and discuss: *What are two ways we can reduce food waste?* Ask volunteers to share their partner's responses with the class. Write responses on the board.

Display the ***Food Recovery Hierarchy slide***. Explain that the U.S. Environmental Protection Agency (EPA) prioritizes these interventions from top to bottom—in other words, the interventions at the top should be explored before moving to the ones at the bottom. Explain each intervention (refer to the ***Wasted Food primer*** for details):

- **Reducing food waste at the source:** Businesses or individuals can avoid purchasing food they will not use.
- **Feeding people:** Excess food can be donated to soup kitchens, food pantries, etc.
- **Feeding animals:** Food that might not be appropriate for humans can be fed to livestock.
- **Industrial uses:** Food waste is used in the manufacture of biofuels and bioproducts such as building materials.
- **Composting:** Through decomposition, this process converts **organic matter**—such as food waste, crop residues, or animal manure—into a dark, spongy material that enhances soil fertility.
- **Incineration or landfill:** If the above interventions are not used, this is where food waste ends up.

Ask: *Why do you think the EPA ordered the list in this way? Do you agree with the order?*

Divide students into five groups and assign each group one of the top five interventions in the food recovery hierarchy (refer to slide). Have students create a proposal for a program to reduce food waste in their assigned area. Encourage them to think about how this applies to their community (e.g., the "feed hungry people" group could create a plan for their school to donate excess cafeteria food to a local soup kitchen). As groups share back, continue to add their ideas to the list on the board.

Wrap-up: Food Waste and Me

[5 minutes]

Have students write a journal entry in response to the prompt: *What are some individual or collective actions that you and others could take to reduce food waste in your home, school, or community?* Optional: Have students share their responses.

Share Your Knowledge: *Ask students to tweet to spread awareness about the problem of food waste and how to reduce it. Use hashtags like* **#stopfoodwaste** *and* **#foodspan** *to join the conversation.*

Extensions:

Revisiting the Infographic (Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food waste. Ask: *Do these accurately and fully represent what we learned about food waste? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Food Waste Audit (Social Studies)

Students will conduct a food waste audit at their school or a similar setting. *LifeSmarts*, a program of the National Consumers League, provides detailed instructions on how to collect and measure food waste, followed by a series of critical thinking questions (lifesmarts.org/food-waste/). The activity is designed for student teams competing in the National LifeSmarts Championship. Anyone can do the activity, but students will not be able to compete unless they are already enrolled in the competition. Visit lifesmarts.org for information about registering.

FoodKeeper App (Social Studies)

Show students how to use the USDA "Food Keeper" app, which alerts users when their food will likely go bad (https://itunes.apple.com/us/app/usda-foodkeeper/id978186100?mt=8). Ask students to practice using the app for a few days and share what they have learned.

Food Waste Investigation with John Oliver (Social Studies, Science)

Students will watch John Oliver's investigation of food waste in America (www.youtube.com/watch?v=i8xwLWb0lLY). Teachers should watch this clip before sharing it with their class to decide whether the content and delivery is appropriate for their students. Students may write a reflection paper on the clip or conduct a research project on a certain aspect of food waste highlighted by Oliver. Note: This clip can also serve as an introduction to the lesson.

Food Recovery Ambassadors (Social Studies, ELA)

Students will create an education campaign to motivate their peers to reduce food waste. Messaging can include tips for keeping food fresh and information about the shelf life of particular foods. This campaign can include posters, morning announcements over the school PA system, "food recovery ambassadors" talking to students in the cafeteria, and social media posts using the hashtags #stopfoodwaste and #foodspan.

Create a Compost Pile (Science)

Students will create a school, classroom, or home compost pile. Consult the U.S. Environmental Protection Agency's website for tips on getting started (www2.epa.gov/recycle/composting-home). Students can share their progress on social media using the hashtags #compost and #foodspan.

1. Buzby JC, Wells HF, Hyman J. *The Estimated Amount, Value, and Calories of Postharvest Food Losses at the Retail and Consumer Levels in the United States*. USDA ERS; 2014.
2. Hall KD, Guo J, Dore M, Chow CC. The progressive increase of food waste in America and its environmental impact. *PLoS One*. 2009;4(11).
3. Gunders D. *Wasted: How America Is Losing Up to 40 Percent of Its Food from Farm to Fork to Landfill*. NRDC; 2012.
4. Leib EB, Gunders D, Ferro J, Nielsen A, Nosek G, Qu J. *The Dating Game: How Confusing Food Date Labels Lead to Food Waste in America*. Harvard Food Law and Policy Clinic and the Natural Resources Defense Council; 2013.
5. U.S. Environmental Protection Agency. Reducing Food Waste for Business. 2014.
6. U.S. Environmental Protection Agency. Basic Information about Food Waste. 2012.

Lesson 14

The Hunger Gap

[Lesson Duration: 55 minutes, plus 15 optional minutes]

National Education Standards Alignment

- Social Studies
- Health

Lesson Overview

Students will consider how to define and measure **hunger** and **food insecurity**, examine community food availability maps, and explore interventions designed to improve food security.

Learning Objectives

- Define hunger and food insecurity and explain how they are different.
- Analyze and interpret community food availability maps.
- Describe criteria for defining a **food desert**.
- Analyze interventions for reducing hunger and food insecurity.

Essential Questions

- How do hunger and food insecurity affect people?
- How can we reduce hunger and food insecurity?
- Who should be responsible for addressing hunger and food insecurity?

Materials

- Student handouts
- Presentation slides
- *Hunger and Food Insecurity* primer
- FoodSpan Infographic

Resources

- *Hunger and Food Insecurity* primer (www.foodsystemprimer.org/food-and-nutrition/hunger-and-food-insecurity/)
- *Food Environments* primer (www.foodsystemprimer.org/food-and-nutrition/food-environments/)

Teacher Note:
The **Take a Stand** *and* **Why Do We Eat What We Eat?** *activities in Lesson 12 can help students start thinking about contributors to hunger and food insecurity.*

Warm-up:
Hunger vs. Food Insecurity

[10 minutes]

Students will reflect on the meaning of food insecurity as a broader concept than hunger. Ask students to offer definitions of **hunger**. *How do you feel when you are hungry? What causes hunger?* After a few responses, explain that when we refer to hunger in this lesson we are referring to the pain, discomfort, weakness, or illness caused by a long-term lack of food.[1]

Ask students what they think the term **food security** means. Have them write a brief definition. Point out that one meaning of security is freedom from anxiety. Have volunteers share and compare their definitions. Display the ***Food Security Definition*** and ***Household Food Security slides***. Compare students' definitions with the slides, and discuss.

"You do not solve the hunger problem by feeding people. ... The problems of hunger and malnutrition can be solved only by ensuring that people can live in dignity by having decent opportunities to provide for themselves."

– George Kent, Freedom from Want

Photo credit: Michael Milli, CLF.

Photo credit: Michael Milli, CLF.

Teacher Note: Hunger and food insecurity can be sensitive topics, and some of your students may themselves experience these conditions. Use caution in situations where students may feel uncomfortable discussing their personal experiences.

Main Activity:
Community Food Security and Food Desert Mapping

Social Studies
[20 minutes]

Explain that food security can be measured at the household, community, and national levels. **Community food security** deals with the features of a community that might affect people's ability to get enough healthy food. Have students brainstorm what some of these features might be.

The term "food desert" is used to describe a community with low access to healthy food. Ask: *What images does the term "food desert" make you picture? What criteria might we use to determine whether a community is a food desert?* Display the ***Food Deserts slide*** and discuss why those criteria might be relevant to community food security.

Students will now analyze maps that demonstrate food availability in three Baltimore neighborhoods. Divide the class into small groups and give each group a copy of the question sheet and one of the three maps from the ***Community Food Availability Maps Handout***. Ask each group to analyze their neighborhood's **food environment**, respond to the questions, and present to the class. Display the ***Community Food Availability Maps slides*** while students present. As a class, discuss each presentation and the differences among the neighborhoods.

The following points may help inform the discussion:

- Compared to smaller stores, supermarkets tend to offer a wider variety of healthy options, at the lowest prices. Despite these advantages, research shows that simply having access to a supermarket does not necessarily improve diets. Additional interventions, such as offering cooking demonstrations and promotional discounts on fruits and vegetables, might be needed to help people to shop and eat healthier.[2]
- Even if supermarkets are part of the solution, getting them into places where they are lacking—such as low-income urban areas—can be challenging. Supermarkets require a lot of land, and urban land is often scarce and expensive. Some store owners have expressed security concerns, and may think they won't get enough business from lower-income shoppers.[2]
- Most people, even those living in food-insecure households, travel to a supermarket to get most of their groceries—even if it means borrowing someone else's car, sharing a ride, or taking public transit.[3] Part of the problem is that those trips may be difficult and infrequent for people living in food deserts, while an abundance of unhealthy food is within easy reach.

Teacher Note: *The* **Community Food Mapping** *extension (at the end of this lesson) can be a helpful follow-up to this activity.*

Main Activity:
Food Insecurity Causes, Effects, and Interventions

Social Studies, Health
[20 minutes]

Show students the ***Hunger Quote slide*** or write this quote on the board: "To many people, hunger means not just symptoms that can be diagnosed by a physician, it bespeaks the existence of a social, not a medical problem."[4] Discuss: *What is the main idea? Do you agree? What does this suggest about how to address hunger and food insecurity?* Students should begin thinking about system-level causes of and responses to these problems.

Divide the class into three groups and distribute the ***Hunger and Food Insecurity primer***. Using the primer, the first group will list causes of food insecurity, the second will list potential effects, and the third will list interventions. If groups need assistance, provide ideas from the following lists:

Causes of food insecurity:

- Poverty (i.e., lack of money to buy healthy food)
- Lack of grocery stores offering healthy options
- Lack of transportation to grocery stores

Potential effects of food insecurity:

- People experiencing hunger and food insecurity are likely to choose foods with the most calories per dollar, which are often not the healthiest options (e.g., fast food)
- Low fruit and vegetable intake
- Obesity
- Diabetes
- Nutrient deficiencies
- Children may be more likely to experience anxiety, depression, poorer academic performance, absences from school, and other physical and behavioral issues

Interventions to address food insecurity:

- Encourage eligible citizens to register for the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Program for Women, Infants and Children (WIC)
- Increase universal breakfast programs in classrooms and community eligibility provisions, which allow schools to offer free lunch for all students
- Encourage corner stores to stock more healthy foods, and support those that already do
- Attract supermarkets to underserved areas or improve transportation to existing ones
- Increase the minimum wage and create employment opportunities
- Establish alternative venues for healthy food purchasing, e.g., mobile markets and farmers' markets

Ask each group to share their list with the class. Discuss: *If you were a policy maker, which interventions would you prioritize? Who should be responsible for addressing hunger and food insecurity?*

Optional Activity: Measuring Food Security

Social Studies, Health
[15 minutes]

Students will analyze a tool that is used with individuals to measure their level of food security. Have students read the ***Measuring Household Food Security Handout***, a USDA survey used to measure food security among youth ages 12 and older. Discuss: *What questions would you add or change to better measure food security, either at the household or community level?* This might include questions about transportation, availability of healthy foods, and knowledge about healthy eating.

Wrap-up: Food Insecurity and Me

[5 minutes]

Have students write a journal entry in response to the prompt: *What feelings do the issues of hunger and food insecurity bring up for you?* If time allows and students feel comfortable, have them share their responses.

Teacher Note: *Food policy interventions to address hunger and food insecurity are also explored in Lesson 15.*

Share Your Knowledge: *How do hunger and food insecurity affect people? How can we reduce hunger and food insecurity? Have students tweet their reflections and tag* **#hunger**, **#foodsecurity**, *and* **#foodspan** *to join the conversation.*

Extensions:

Revisiting the Infographic
(Social Studies)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent hunger and food insecurity. Ask: *Do these accurately and fully represent what we learned about hunger and food insecurity? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Film: *Food Frontiers*
(Health, Social Studies)

The Center for a Livable Future's original short film, *Food Frontiers* (36 minutes, www.foodspan.org/films/food-frontiers.html), showcases six projects from around the U.S. that are increasing access to healthy food in varied and innovative ways. A discussion guide is provided.

Community Food Mapping
(Social Studies)

Have students create maps of their own communities, noting all food sources (e.g., grocery stores, restaurants, farmers' markets, community gardens) and the distances between them and where people live. Students may additionally include information about sidewalks, bus routes, income levels, or any other features or data that may affect access to (or availability of) healthy food. Based on this information, have students write a paper or give a presentation about the food environment in their community. Students should make note of any additional information they would need in order to better measure and improve community food security.

History of Hunger Interventions
(Social Studies, ELA)

Students will use the ***Hunger and Food Insecurity primer*** as a starting point to research the history of interventions to address hunger. Students will write a report comparing the effectiveness of different types of interventions, from soup kitchens to federal food and nutrition assistance programs. Based on this information, students will work in groups to design a program to improve food security at the local, state, or national level.

The Challenges of Eating Healthy on a Budget
(Social Studies, Health)

Students will watch the documentary film *A Place at the Table* (https://www.imdb.com/title/tt1736049/) to explore the challenges of eating a healthy diet on a limited budget. After they watch and discuss the film, challenge students to plan a week of healthy meals using only the benefits provided by SNAP (food stamps), which amount to a little over $4 per person per day.[5] Encourage students to share their reflections on social media using #foodspan and #foodsecurity.

1. Andrews M, Nord M, Bickel G, Carlson S. *Household food security in the United States, 1999.* USDA ERS, 2000.
2. Refer to the *Food Environments* primer for references. www.foodsystemprimer.org/food-and-nutrition/food-environments/
3. Ver Ploeg M, Mancino L, et al. *Where Do Americans Usually Shop for Food and How Do They Travel To Get There? Initial Findings from the National Household Food Acquisition and Purchase Survey.* USDA ERS, 2015.
4. President's Task Force on Food Assistance. *Report of the President's Task Force on Food Assistance.* Washington, DC; 1984.
5. USDA FNS. *Supplemental Nutrition Assistance Program (SNAP).* 2016. http://www.fns.usda.gov/pd/supplemental-nutrition-assistance-program-snap

Community Food Availability Maps

1. **What is the name of this community?**

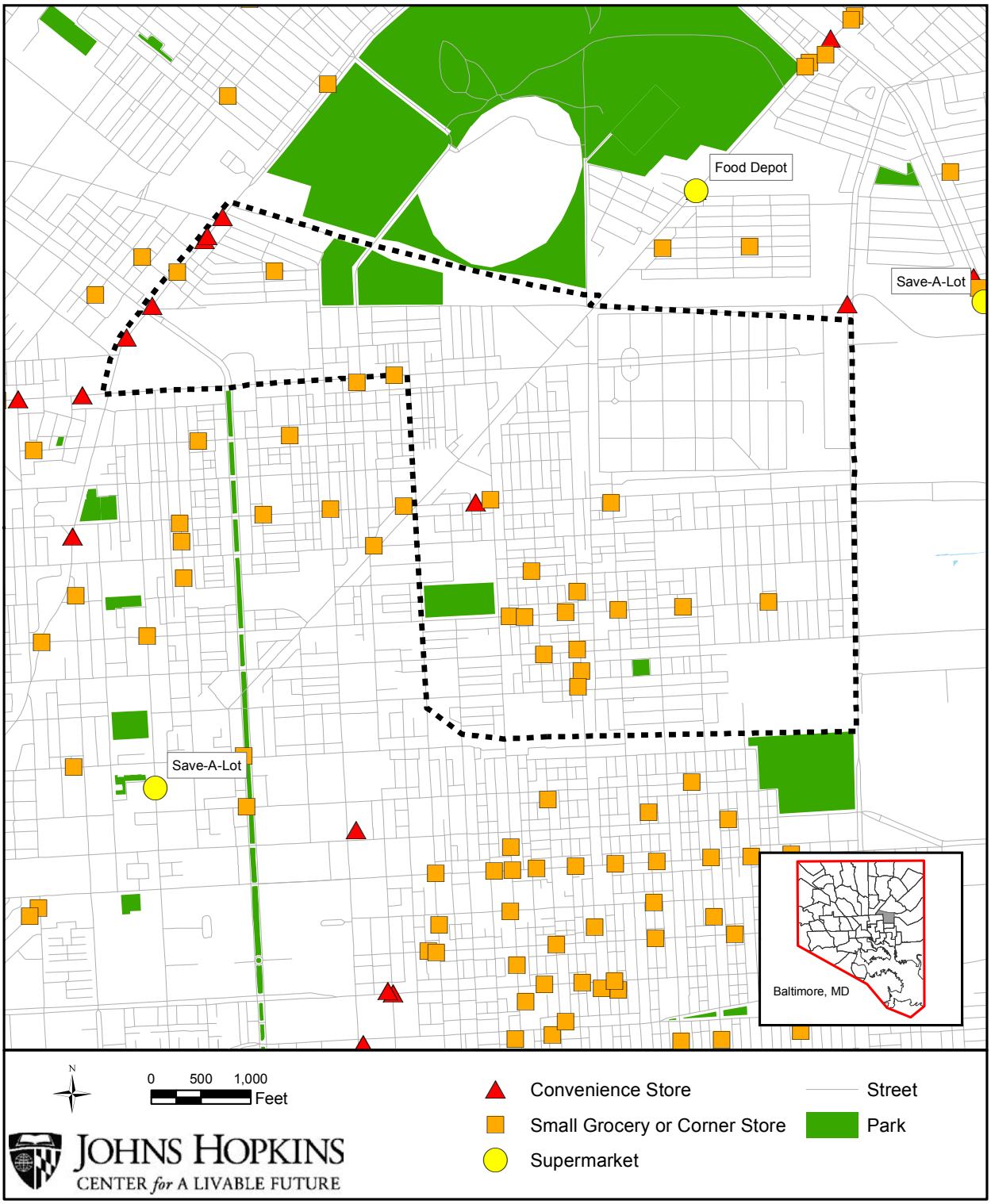
2. **From what type of store(s) do you think most residents in this community get the majority of their food? How might this differ among residents who have access to a vehicle versus those who don't?**

3. **Does this type of store(s) generally offer a variety of healthy options, such as fruits, vegetables, whole grains, and beans, at affordable prices?**

4. **Based on the information given, how would you describe how difficult it is for residents of this community to get enough healthy food? Would you consider this community a food desert? Why or why not?**

5. **What additional information might help you better measure how difficult it is for residents of this community to get enough healthy food?**

Community Food Availability Map: Clifton Park

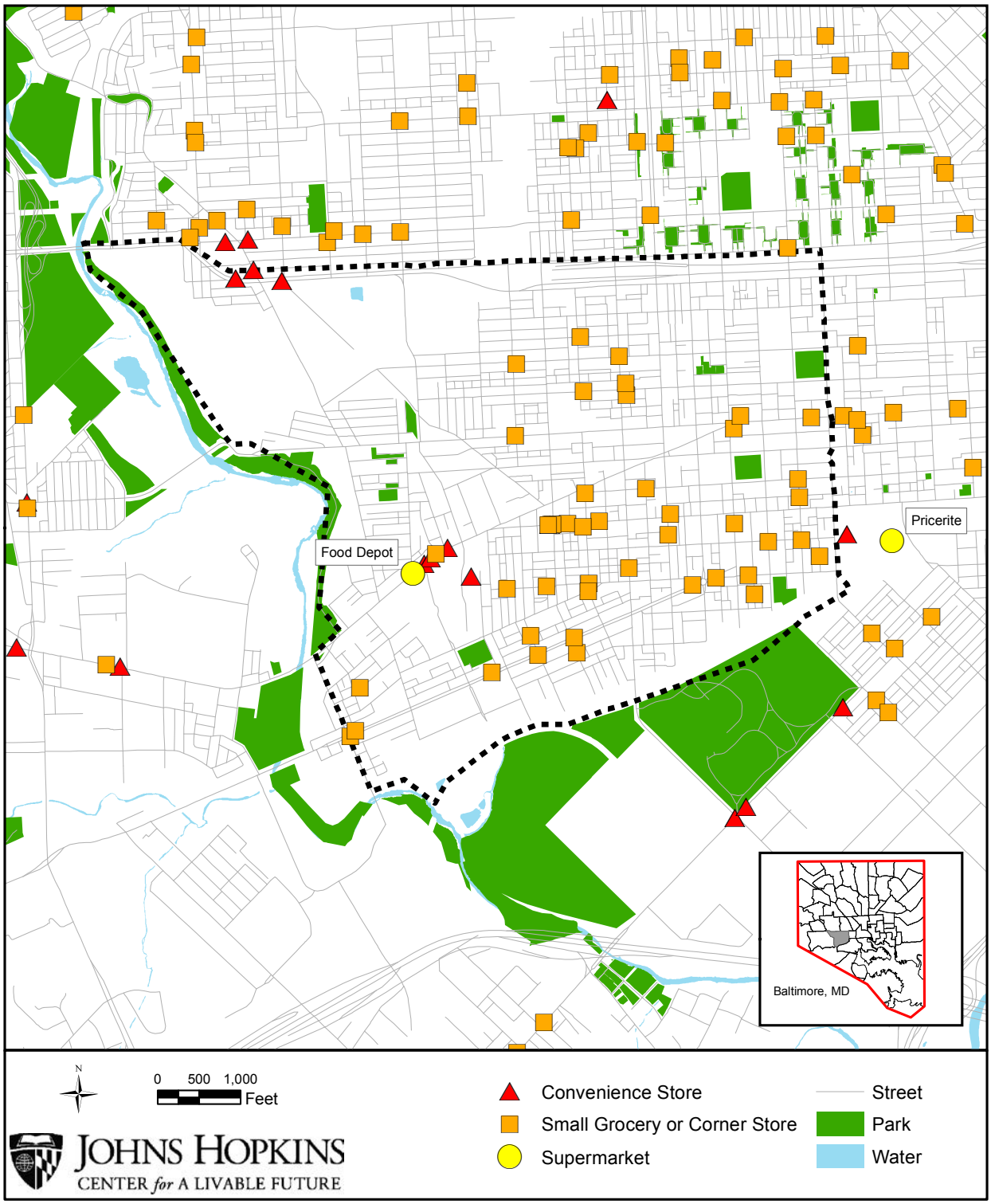


- Median household income: $25,737
- Percent of households with no vehicles available: 44.2%

Maryland Food System Map. Johns Hopkins Center for a Livable Future. http://mdfoodsystemmap.org/

Baltimore Neighborhood Indicators Alliance. Jacob France Institute. http://bniajfi.org/

Community Food Availability Map: Southwest Baltimore

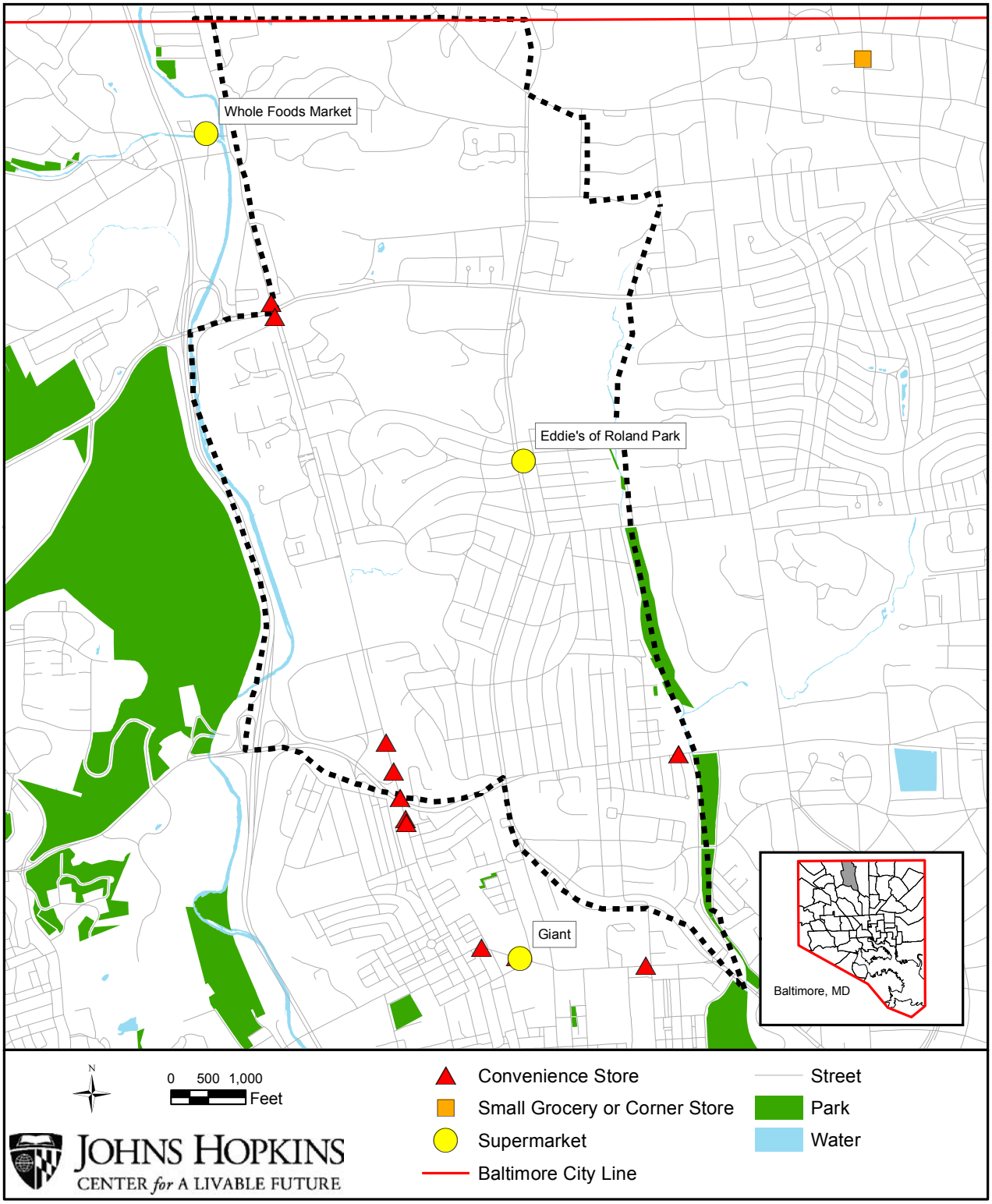


- Median household income: $24,946
- Percent of households with no vehicles available: 52.8%

Maryland Food System Map. Johns Hopkins Center for a Livable Future. http://mdfoodsystemmap.org/

Baltimore Neighborhood Indicators Alliance. Jacob France Institute. http://bniajfi.org/

Community Food Availability Map: Roland Park



- Median household income: $104,481
- Percent of households with no vehicles available: 4.4%

Maryland Food System Map. Johns Hopkins Center for a Livable Future. http://mdfoodsystemmap.org/

Baltimore Neighborhood Indicators Alliance. Jacob France Institute. http://bniajfi.org/

Measuring Household Food Security

The USDA produced this household food security survey to use with youth ages 12 and older.

The following questions are about the food situation in your home during the last month.

1. Did you worry that food at home would run out before your family got money to buy more?

..... A LOT ..... SOMETIMES ..... NEVER

2. Did the food that your family bought run out, and you didn't have money to get more?

..... A LOT ..... SOMETIMES ..... NEVER

3. Did your meals only include a few kinds of cheap foods because your family was running out of money to buy food?

..... A LOT ..... SOMETIMES ..... NEVER

4. How often were you not able to eat a balanced meal because your family didn't have enough money?

..... A LOT ..... SOMETIMES ..... NEVER

5. Did you have to eat less because your family didn't have enough money to buy food?

..... A LOT ..... SOMETIMES ..... NEVER

6. Has the size of your meals been cut because your family didn't have enough money for food?

..... A LOT ..... SOMETIMES ..... NEVER

7. Did you have to skip a meal because your family didn't have enough money for food?

..... A LOT ..... SOMETIMES ..... NEVER

8. Were you hungry but didn't eat because your family didn't have enough food?

..... A LOT ..... SOMETIMES ..... NEVER

9. Did you not eat for a whole day because your family didn't have enough money for food?

..... A LOT ..... SOMETIMES ..... NEVER

United States Department of Agriculture, Economic Research Service. *Self-Administered Food Security Survey Module for Youth Ages 12 and Older*. 2015. http://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/survey-tools.aspx#youth.

Lesson 15

Food Policy in Action

[Lesson Duration: 45 minutes, plus 20 optional minutes]

National Education Standards Alignment

- Social Studies
- Science
- Health

Lesson Overview

Students will explore key areas of policy influence on the **food system** and learn how individuals and communities can influence food policy decisions. The lesson wraps up with a mock **food policy council**, where students will adopt the perspectives of different stakeholders and propose their own food policy interventions. This lesson leads naturally into the culminating Food Citizen Action Project.

Learning Objectives

- Explain how policy influences the food system and provide examples.
- Analyze the power of engaged citizens to change the food system through policy.

Essential Questions

- How can policy address food system problems?
- How can individuals and communities influence food policy?

Materials

- Student handouts
- Presentation slides
- *Food Policy* primer
- FoodSpan Infographic

Resources

- *Food Policy* primer (www.foodsystemprimer.org/food-policy)

Warm-up: Mapping Policy's Influence

[5 minutes]

Have students look at their ***FoodSpan Infographic*** and mark areas where they think the government has influence and how. Ask volunteers to share their ideas and discuss: *How does government policy affect the food system?*

Main Activity: Prioritizing Federal Food Policy Goals

Science, Health, Social Studies
[15 minutes]

Students will examine key areas of food policy and debate which types of programs should be prioritized.

Have students read the ***Food Policy Goals Handout*** to familiarize themselves with these goals: supporting farmers, feeding the hungry, keeping the food supply safe, and protecting the environment (refer to the ***Food Policy primer*** for references and additional details). Note that policies may be unsuccessful in meeting these goals.

Divide students into small groups to discuss how they would prioritize these goals. Have each group create a pie chart showing the percentage of the federal food policy budget they would devote to each goal. Have each group choose a representative to present their chart and explain the rationale for their priorities. Encourage debate between groups with conflicting priorities.

Teacher Note: *Consider giving students the option to make the pie bigger. What other food policy goals should receive funding? What other federal expenditures would you reduce in order to expand the pie?*

Teacher Note: *While this lesson is about both food and agricultural policy, for the sake of brevity we just say "food policy."*

Main Activity: Mock Food Policy Council

Social Studies
[20 minutes]

Food policy councils bring together stakeholders in the food system to study it and recommend ways to make it more equitable and **sustainable**. Display the ***Food Policy Council slides*** to provide information about the purpose and makeup of a food policy council.

Assign each student a stakeholder role on a food policy council (see slide). Multiple students can have the same role. Distribute the ***Food Policy Council Roles Handout*** and have students consider their stakeholder's perspective and goals. Have each stakeholder propose at least one policy idea, from their perspective, to improve the food system in their city, state, or region. Encourage debate. Then, have each stakeholder vote for the top three policy ideas.

Optional Activity: Food Policy Case Studies

Social Studies
[20 minutes]

Students will explore the role of the government in the food system by looking at two historical case studies. Divide students into pairs and distribute the ***Food Policy primer***. One member of each pair will read about the Agricultural Adjustment Act (see the *Supporting Farmers* section); the other will read about the creation of government hunger relief programs (see the *Feeding the Hungry* section). Then, students will exchange what they learned with their partner.

As a class, discuss:

- *Should the government renew its involvement in regulating market prices for food? If so, why?*
- *What might happen if the government did not offer economic support to farmers?*
- *How might we decide whether federal hunger relief programs are effective?*
- *What policies might better support a healthy, sustainable food system?*

Teacher Note: *Many of the ideas pioneered in the Agricultural Adjustment Act live on in what became known as the U.S. Farm Bill, which is arguably the most influential piece of legislation on the U.S. food system. The* **Policy Research Project** *extension allows students to explore the Farm Bill in greater detail.*

Wrap-up: My Role in Food Policy

[5 minutes]

Have students write a journal entry in response to the prompt: *What is one federal, state, or local policy that you would create or change to improve the food system in your community? Why?* Optional: Have students share their responses. This activity leads naturally into the culminating Food Citizen Action Project.

Extensions:

Revisiting the Infographic (Social Studies, Science)

Distribute copies of the ***FoodSpan Infographic*** (students may already have their own from previous lessons). Ask students to identify parts that represent food policy. Ask: *Do these accurately and fully represent what we learned about food policy? If not, what could we add to make the infographic more accurate?* Working individually or as a class, have students draw their own versions, create a collage, or add images to the existing infographic. Share photos of students' work on social media and tag #foodspan.

Film: Food Citizens on Film (Social Studies)

Students will watch and analyze a film about a community's struggle for food system change, such as *The Garden* (https://www.imdb.com/title/tt1252486/). Discuss: *What does this film show about the power of communities to change the food system through policy? What can we learn from the successes and failures depicted in the film? How might we lead similar movements?*

Policy Research Project (Social Studies, ELA)

Each student will conduct a research project examining one policy area in the Farm Bill—such as economic support to farmers, nutrition assistance, or environmental conservation—and analyze the debate surrounding it. *What does the policy aim to do? Why do proponents of the policy support it? Why do opponents disagree with it? Which stakeholders, if any, does it benefit and which, if any, does it hurt? How could this policy be changed to make it more effective?* Have students share what they learned.

Share Your Knowledge: *How can policy help address food system problems? What food policies should we create or change? What can individuals do? Ask students to tweet their reflections and tag* **#foodpolicy** *and* **#foodspan** *to join the conversation. Include the handles of your state or federal representatives to make sure your voice is heard!*

Food Policy Goals Handout

The policies of local, state, and federal governments determine, to a considerable degree, how we farm and what we eat. Ideally, these policies would help to ensure that all people have access to safe, affordable, healthy food; protect our air, water, and land; support the farmers and workers who put food on our tables; and uphold rigorous standards for the welfare of animals used for food.

Supporting Farmers

Historically, the government has given economic support to farmers to:

- Insure farmers against crop loss (for example, from pests or unpredictable weather).
- Incentivize farmers to conserve soil and wetlands.
- Provide a stable price for crops, even if the market price falls.
- Set minimum prices for crops.
- Support agricultural research and development of new technologies.

Feeding the Hungry

Federal food and nutrition assistance programs like SNAP (food stamps) and Women, Infants and Children (WIC) help low-income families put food on their tables. These programs also:

- Boost the economy by allowing participants to spend more on food.
- Support local economies when SNAP benefits are accepted at farmers' markets.
- Alleviate hunger, at least in the short term, and can support/aid the most vulnerable populations.
- In addition, the U.S. government purchases surplus grain from farmers and distributes it to other countries in need. In countries that receive food aid, however, farmers may see their own prices drop with influxes of donated grain.

Keeping the Food Supply Safe

The U.S. Food and Drug Administration (FDA) and Department of Agriculture (USDA) work to reduce the risks of foodborne contamination. These agencies:

- Inspect processing facilities for signs of contamination.
- Require producers, processors, restaurants, and other businesses to follow food safety protocols.
- Respond to foodborne illness outbreaks.
- Regulate drugs and chemicals used in food animal production, including antibiotics.

Protecting the Environment

Agriculture affects air, water, land and climate. Policies can help conserve resources, reduce pollution, and promote more ecologically sound farming practices. In addition to regulating agricultural pollutants, environmental protection efforts offer incentives for farmers to:

- Reduce soil erosion and runoff
- Conserve freshwater
- Shift to renewable energy sources
- Preserve wetlands
- Protect wildlife habitats
- Minimize agricultural pollutants

Food Policy Council Roles Handout

- **School food service director:** oversees purchasing for school cafeterias, plans menus, etc.
- **Public health advocate:** provides guidance on nutrition, food security and other public health issues in the food system.
- **Hospital administrator:** manages food purchasing for hospitals, often involved in community health initiatives.
- **Anti-hunger advocate:** focuses on food access for disadvantaged populations.
- **City planner:** works on policies that affect where food can be sold and/or grown.
- **Supermarket manager:** manages food purchasing and relationships with distributors, customers and sometimes farmers.
- **Restaurant owner:** manages food purchasing and relationships with distributors, customers and sometimes farmers.
- **Community member:** represents the interests of communities, such as food access and local food production.
- **Farmer:** produces and sells food in the city or region served by the food policy council.
- **Labor representative:** represents the interests of food system workers, such as fair wages and safe working conditions.
- **Representative from an environmental nonprofit:** provides guidance on how the food system impacts air, water, soil, climate, biodiversity, and other parts of the environment.