

FOOD AND THE ENVIRONMENT: ENVIRONMENTAL IMPACTS OF THE MODERN FOOD SYSTEM



SUMMARY

This lesson demonstrates how the modern food system negatively impacts our environment. It illustrates some of the harmful effects that food production and transport have on our air, water, land, soil, and the health of plants and animals.

Duration: 90 mins, 2 Sessions | Grade Level: 4th-7th



Module 1: Food and the Environment

Environmental Impacts of the Modern Food System

LESSON CONTENTS

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LESSON RESOURCES

greenbeetz.org

our website hosts lesson slides, google forms, lesson videos, and teacher training videos, glossary, standards alignment and more

Worksheets

- History of Food Timeline Cards and Demo
- Video Worksheet
- Exit Card Assessment

ENVIRONMENTAL IMPACTS OF THE MODERN FOOD SYSTEM: AT A GLANCE

ESSENTIAL QUESTION

How quickly has our food system become what it is today and what repercussions does this fairly new system of growing/raising food mean for our bodies and our environment?

STUDENT LEARNING GOALS AND OBJECTIVES

After this lesson students will be able to:

- Understand the effects of the modern food system on the environment.
- Evaluate the pros and cons of the modern food system.

VOCABULARY

- **Modern Food System** - how the majority of our food is grown now
- **Local Food Sources** - food grown by farmers within your region (nearby - less distance)
- **Factory Farms/Industrial Farms** - farms that run like factories
- **Mass Distribution** - giving out huge amounts of something
- **Mass Consumption** - huge amounts of people eating/using
- **Natural Resources** - found in the earth or grown; not made
- **Contaminated** - ruined
- **Pesticides** - chemicals to kill “pests” or bugs
- **Antibiotics** - medicine to fight infections
- **Hormones** - synthetic substance given to make animals grow faster/larger

KEY POINTS

- The major downside of the modern food system is the harmful effects on our air, water, land, and soil, as well as the health of our plants and animals.
- Factory farm animals are often kept in poor living conditions. Packing the animals close together increases sickness in the animals and increases germs and toxic chemicals to leach into our water and crops.
- Modern farming methods often result in poor soil quality, loss of animal habitats, and the need for pesticides and chemical fertilizers..
- Moving food across the country and the world causes a lot of pollution from trucks, trains, boats, and airplanes.
- Much of the packaging from processed foods fills up our landfills, pollutes waterways and oceans, and releases harmful toxins into our environment.

PRIOR KNOWLEDGE AND MISCONCEPTIONS

PRIOR KNOWLEDGE

In previous lessons, students have been asked to think about the positive and negative impacts of the modern food system, so they will have some ideas about the benefits (feeds more people) and the negatives (animals looked like they were living in overcrowded farms from the video; modern food system includes more processed food, negative impacts on our environment).

COMMON MISCONCEPTIONS

POSSIBLE RESPONSE

Depending on previous discussions, students may still think there are only positive impacts of the modern food system—especially if they eat mostly processed food and have not previously been introduced to the idea that it might not be as healthy for their bodies or the Earth.

Be sensitive about how you and students speak about “unhealthy” food, so no child feels as though the food their families buy is “bad.” Put processed foods in context: although they are less healthy, they are affordable, last longer, easily available, and often taste good. The goal is not to never eat processed foods, but rather to have a balanced diet that includes more fresh and whole foods than processed ones.

Be sensitive to the fear that some students may have or develop about the negative impacts on our environment. Be sure to explain how individuals and governments work to protect the environment and how, in the past, humans have been able to reverse the damages we’ve inflicted upon the environment.

Students may struggle with understanding what inputs and outputs are and they may struggle to understand the complexity of each term.

One way to help is to make sure you have them clearly identify that there is a “system” that needs things to make it function. The inputs are what are needed (fertilizers, water, electricity, etc.). The system processes (factories, transportation, etc.) will have outputs, what comes out as a result of the system (pollution, waste, etc.). These outputs also have effects (on humans and the Earth).

LESSON BREAKDOWN

TIME	ACTIVITY	MATERIALS/RESOURCES
PART 1		
3-5 min	Food Systems Introduction	Lesson Slides
5 min	Modern and Natural Food System Diagrams	Food Systems Diagrams: <ul style="list-style-type: none"> • The Natural Food System • The Modern Food System
5-7 min	Video: Environmental Impacts of the Modern Food System	Vimeo or YouTube <ul style="list-style-type: none"> • Video Worksheets
10-15 min	Class Discussion & Vocab Review	Lesson Slides
5 min	Food Detective Assessment	Exit Card
Extension Activity (<i>optional</i>)		Essays
PART 2		
5 min	Re-introduce the Modern Food System	The Modern Food System Diagram
15-20 min	Activity: Inputs & Outputs Theater	Paper and pencil or nametag stickers
5-10 min	Snackz & Factz	<ul style="list-style-type: none"> • Rainbow carrots & hummus dip OR • Different apples to taste (3 or more varieties to compare)
10 min	Test Your Noodle	Slides
5 min	Food Detective Assessment	Exit Card

DETAILED LESSON SCRIPT: PART I

Food Systems Introduction

3-5 minutes

LESSON SLIDES



SAY

Ask students what kind of packaging was involved in their breakfast?

Follow-Up Critical Thinking Question:

Where do you think your food packaging ends up?

DO

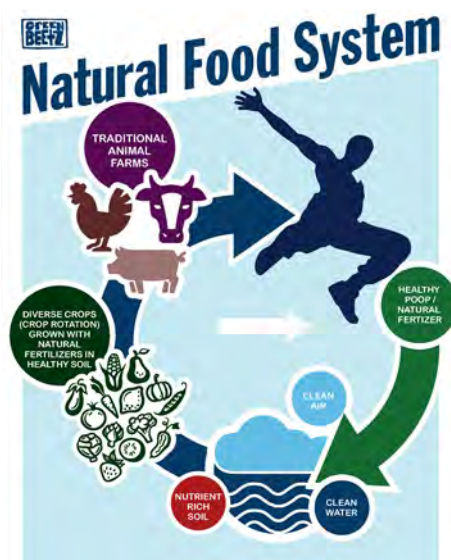
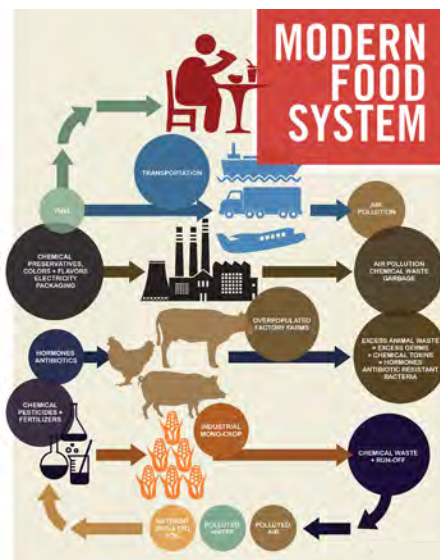
Have your students give a thumbs up or down as you call out options:

Styrofoam packaging/cup, plastic wrap, plastic packaging/bag, zip-lock, plastic grocery bag, paper, foil, none, etc.

Modern and Natural Food System Diagrams:

5 minutes

Project the Food System Diagrams or print copies. Ask students to Turn & Talk or share out as a class the differences that they notice between the two food diagrams: the Modern Food System vs. the Natural Food System. Record their answers and allow these responses to lead into the introduction of today's video.



Lesson Video: Environmental Impacts of the Modern Food System

5-7 minutes

To help students understand and retain information, you can have them use the video worksheet found in the resources for this lesson plan. If you don't want to use the worksheet, you can instead ask them to pay attention to the key words while watching.



DIFFERENTIATION VIDEO WORKSHEETS

The vocabulary and concepts in this video are sophisticated. You should decide which structure will help your students access the information:

1. Preview the questions as a class,
2. Have students watch the video and ask questions,
3. Watch the video more than once, pausing at key moments, etc.

Class Discussion & Vocab Review

10-15 minutes

Have a partner, group, and/or open discussion to address these questions after the video.

Discussion questions for consideration:

- *What did the Modern Food System Farm/Industrial Farm look like?*
- *Were you surprised by anything you saw in the video?*
- *Did you notice things in the Modern Food System/Industrial Farm that looked unhealthy to eat?*
- *What was unhealthy for the environment?*
- *How would you like the animals you eat to be raised?*

Key Points & Vocabulary

Vocab Review

You can review the vocabulary by assessing how familiar students are with the words (you can use a thumbs up, sideways, or down strategy). If most students know a word, you can have students give examples or a definition of each word, reflecting on the lesson video is possible

VOCABULARY 	
Modern Food System	How the majority of our food is grown now
Local Food Sources	Food grown by farmers within your region (nearby—less distance)
Factory Farms/ Industrial Farms	Farms that run like factories
Mass Distribution	Giving out huge amounts of something
Mass Consumption	Huge amounts of people eating/using
Natural Resources	Found in the earth or grown; not man-made
Contaminated	Ruined
Pesticides	Chemicals to kill “pests” or bugs
Antibiotics	Medicine to fight infections
Hormones	Synthetic substance given to make animals grow faster/larger

Key Points & Vocabulary (CONTINUED)

KEY POINTS



Today, most of the food we eat comes from factory and industrial farms. Factory and industrial farms maximize food production with the use of technology and chemicals. They crowd animals and crops close together and use chemicals, hormones, and antibiotics to speed up their growth.

Transportation, Processing, & Waste

Processing food and transporting it all over the world consumes large amounts of electricity and gasoline; producing air and water pollution. The paper and plastic materials from packaged foods end up in garbage dumps, landfills, and oceans, polluting the Earth.

Land/Soil

Large amounts of land are required to make room for industrial farms. Around the world, many important habitats have been cleared away and destroyed for this purpose. Factory farms grow crops in large monocultures and continuously grow on the same land. Traditional farming methods cycle different crops, grow multiple crops together, and allow the soil to rest for a season or longer to return nutrients to the soil.

Chemical inputs to grow large yields

To maximize yields, industrial farms use chemicals like pesticides and herbicides that end up in the soil, water, and the food we eat, which can be unhealthy for both people and the other inhabitants of Earth.

Factory Farms and their effects (brief)

Factory farms cram large numbers of cows, chickens, pigs, and turkeys together in very close living quarters, often with little sunlight or fresh air. These unhealthy conditions make it necessary for animals to be given antibiotics to prevent illness. The incredibly large amounts of urine and feces concentrated together in one location can lead to chemical, hormonal, and bacterial contamination of nearby waterways and have lasting effects on our health as well as huge environmental consequences.

Food Detective Assessment

5 minutes

Have students answer the following on an Exit Card:

- *What are the cons of the modern food system?*

Lesson Extension: Food Journey Essays (Optional)

There are a variety of essay topics in the resource section of this lesson that "track" the steps a processed food and similar whole food took from seed to plate. Distribute the essays and decide if you want to give your students a chance to read them individually, with a partner, or in groups. You could also read one essay aloud, discuss as a class, and then assign the rest of the essays to groups and discuss together.

Lesson Extension Essays

INSTRUCTIONS TO STUDENTS

1. Compare and contrast the 2 stories and discuss which one sounds better. Why?
2. Highlight 2-3 things from the essays that SURPRISED you.
3. Circle 1-3 things from the essays that you have a QUESTION about or write them on the back of the essay handout.
4. Draw a diagram or picture showing the different steps along the way from farm to your Plate.

Compare these 2 food journeys:

FAST FOOD CHICKEN NUGGETS
vs.
ORGANICALLY RAISED ROAST CHICKEN



THE JOURNEY OF FAST FOOD CHICKEN NUGGETS

Have you ever wondered where that yummy chicken nugget came from? Where is the chicken nugget farm? And how did it get all the way to your takeout bag? You won't be surprised to learn that there are no little chicken nuggets running around on a farm somewhere. You may find it interesting to know that the nugget in your bag may have been to more states than you!

There are four large chicken companies in the US that provide nearly all of the chicken that we eat. The chicken used for your nugget was hatched at one of their factories, called a hatchery. Soon after, the chicks were boxed up and loaded onto trucks to be taken to a factory farm.

Factory farms are run by farmers who follow the rules of the chicken company. They grow the chickens just how the company tells them to. They keep the chickens in large buildings where they do not have fresh air or sunlight. There are lots of chickens in these buildings. They are given antibiotics so that they do not get sick. Factory chickens grow fast and have lots of

white meat. This means that their bones cannot keep up with their growth. They have poor balance due to their extra white muscle in the front. Even if there was room to move around a lot, many chickens couldn't do it anyway.

After about 49 days, the grown chickens are loaded back into crates. The crates are loaded onto trucks, and they return to the factory. There they will be processed into different cuts of meat. To make chicken nuggets, the white meat is ground up and mixed with water, salt, starches, chemicals and flavorings. This chicken mash is then pressed and cut into chicken nugget shapes. The nuggets are coated in a batter made from corn, wheat, and other ingredients. Finally, they are partially fried in oil and frozen.

Fast food chicken nuggets are packaged to be trucked to restaurants all over the country. They may have to travel hundreds of miles. When they arrive the packaging is removed and thrown away. The nuggets are dipped into boiling hot oil to finish cooking them. Finally, they are packaged in a box and served to you.

Compare these 2 food journeys:

FAST FOOD CHICKEN NUGGETS
vs.
ORGANICALLY RAISED ROAST CHICKEN



THE JOURNEY OF ORGANICALLY RAISED ROAST CHICKEN

Have you ever wondered where your food comes from? If you like chicken, you may wonder about where the chicken lived and how it gets to your plate. If you are one of the few people who eat organically grown chicken, the story is really quite simple. Well, it is simple if the recipe is simple! Let's take a look at how organically grown roast chicken makes its way to your mouth.

Imagine Old MacDonald's farm. Do you see it? There is the red barn, a few horses, and some cows. Look closer. Can you see the different chickens clucking around, scratching and pecking at something on the ground? There are farms like this in Upstate New York, that raise chickens in much the same way that they were raised one hundred years ago.

On these farms, chickens hatch from eggs and grow up outside, free to roam the farm. They scratch for bits of food like insects on the ground. They stretch their wings, they eat food that is chemical-free, and they grow at a

healthy pace. Not too fast. Not too slow. Most of these chickens will take about three months to become a full-grown adult. They may become egg-laying hens for a time, or they may be harvested sooner.

When it is time for a chicken to become food, it is killed, cleaned, and brought to a New York City farmer's market or local grocer. If your family buys the chicken at this kind of market, you may even have a chance to talk to the farmer who raised it! There are farmer's markets across the city, so you shouldn't have to travel too far to get it home.

The last part of the story depends upon the recipe. What seasonings does your family like to use? Will it be roasted in an oven or a slow-cooker? Will you roast it with vegetables? Which ones? If you pay close attention or help while it is being prepared, you will know exactly how the last chapter goes. You will know, because you are an important part of this story!

DETAILED LESSON SCRIPT: PART II

Re-Introduce the Modern Food System

3-5 minutes

Return to the diagram of the Modern Food System and explain that this system requires lots of inputs—items that are created outside of the food system then added in. These inputs often result in additional outputs besides food. Review the Vocab and lesson objectives as needed before introducing the next activity.



Activity: Inputs & Outputs Theater

15-20 minutes

SET-UP FOR TEACHERS

Divide your class into the following 4 groups. Most students will fall into Groups 1 and 2.

MATERIALS

- Pre-made slips of paper/name tags of each input, system, earth, environment, and humans written on it
- The "answer key"

Inputs (Group 1)	Labels/pieces of papers with the following inputs: Fuel, Preservatives, Colors & Flavoring, Electricity, Packaging, Pesticides, Fertilizers, Antibiotics, Hormones
Systems (Group 2)	Labels/pieces of papers with the following systems: Transportation, Food Processing Factory, Industrial Mono-crop farm, Overpopulated Factory
Earth/Environment (Group 3)	Labels/name tags with the following: Earth/Environment
Humans (Group 4)	Labels/name tags with the following: Humans



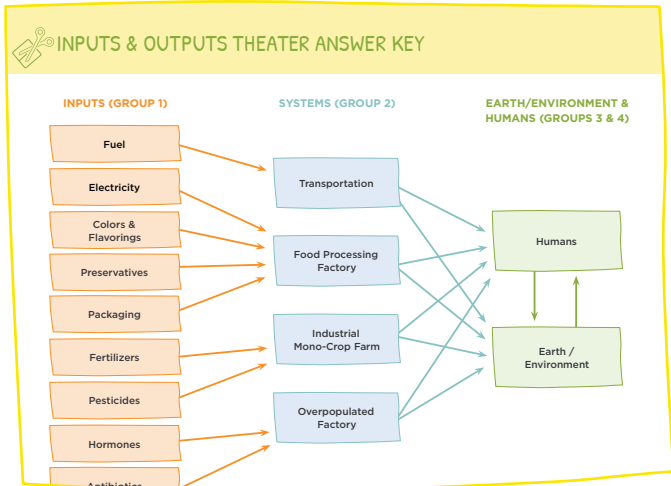
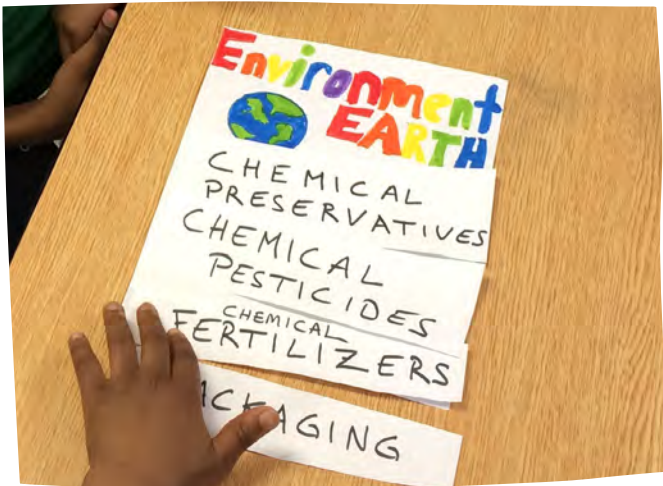
Activity: Inputs & Outputs Theater (CONTINUED)

DIRECTIONS FOR YOUR STUDENTS

Inputs (Group 1)	Group 1 students have to decide which member of Group 2 (Systems) receive their input card and explain their choice (there is more than one correct answer).
Systems (Group 2)	Once Group 2 has received their input cards, they must decide whether they give to Group 3 (Environment/Earth) or Group 4 (Humans) and explain their answer (there is more than one correct answer).
Earth, Environment, & Humans (Groups 3 & 4)	Groups 3 and 4 present the cards they received to the class and explain why they think they received these inputs/outputs.

DIFFERENTIATION

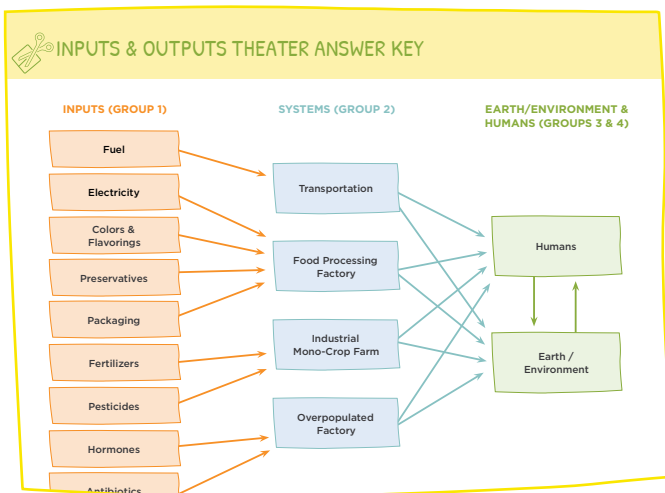
Groups 3 and 4 will need to explain, verbally, the reasons why they think they were given the cards they received. Be strategic about who are in these groups and/or partner students up and allow them to talk before they share with the whole class. Make sure students understand how different groups will “give” their cards. Be sure to emphasize that there can be multiple answers, which is why students need to explain their reasoning (groups 3 & 4). When you are done, you can show them the “answer” key





INPUTS & OUTPUTS THEATER ANSWER KEY

THE OUTPUTS OF:	EFFECTS ON HUMANS, ENVIRONMENT/EARTH
Transportation	<ul style="list-style-type: none"> • Air Pollution • Global Warming • Water Pollution • Carbon Emissions
Food Processing Factories	<ul style="list-style-type: none"> • Air Pollution • Global Warming • increased packaging waste in landfills • Water Pollution • Carbon Emissions
Industrial Mono-crop Farms	<ul style="list-style-type: none"> • Air Pollution • Global Warming • Chemical runoff into waterway—decreasing animal biodiversity such as fish, amphibians, microflora, etc. • Water Pollution • Carbon Emissions
Overpopulated Factory Farms	<ul style="list-style-type: none"> • Air Pollution • Global Warming • Increased runoff of antibiotics in our drinking water • improper working conditions for farm workers. • Water Pollution • Carbon Emissions from manure • increased consumption of hormones through food products from factory farms,



Snackz & Factz

10 minutes

DO

Have students prepare a snack from the school garden if possible.

Present/Display the “Facts” about today’s Snack to the class as they are tasting.

SAY

What is the benefit of eating something grown locally, such as from your school garden or not too far from where you live?



MATERIALS

- Rainbow carrots and hummus dip
- A variety of different apples (3 or more varieties to compare)

FACTZ

Ways to learn more about the food you eat

Buy food from a local farmers market and talk to the farmer.

Ask your grocer questions.

Read labels (they will learn more about food labels in future lessons, too). More ingredients on the label usually means more processing.

Make it at home—you will know the final steps of getting it to your plate.

The benefits of eating food grown close to “home”

You know exactly how the food was grown (what inputs or outputs were needed)

You know if any chemicals, pesticides, fertilizers, were used in the growing of the food

When we grow food close to home we decrease costs and pollution related to transportation. We can eat and prepare the food at its freshest, and benefit from peak flavor and nutrition. Children are more likely to eat foods that they helped grow or have a connection to—therefore eating less processed foods.

Test Your Noodle

10 minutes | (Optional: students complete this online)

1. Name one negative aspect of factory farming animals
(poor living conditions for animals, need for excess chemicals to keep animals healthy, excess waste that can lead to toxic chemicals and diseases that contaminate local waterways)
2. Multiple Choice: What is the term for growing large amounts of just one crop?
 - a. Selective farming
 - b. Mono-culture**
 - c. Prize crop
 - d. Single harvest
3. What is one benefit of eating food grown locally?
(less transportation cost, less pollution caused by long transportation distances, you might be able to speak with the farmer)
4. List two ways to know more about how your food gets to your plate (prepare your own food, ask your grocer, purchase from farmers markets and other markets that select food based on where and how it is grown such as food-coops, consumer guides such as Seafood Watch, read food labels)
5. Name two “inputs” of the modern food system.
(pesticides, herbicides, hormones, antibiotics, fertilizer, fossil fuels/gas)

Food Detective Assessment

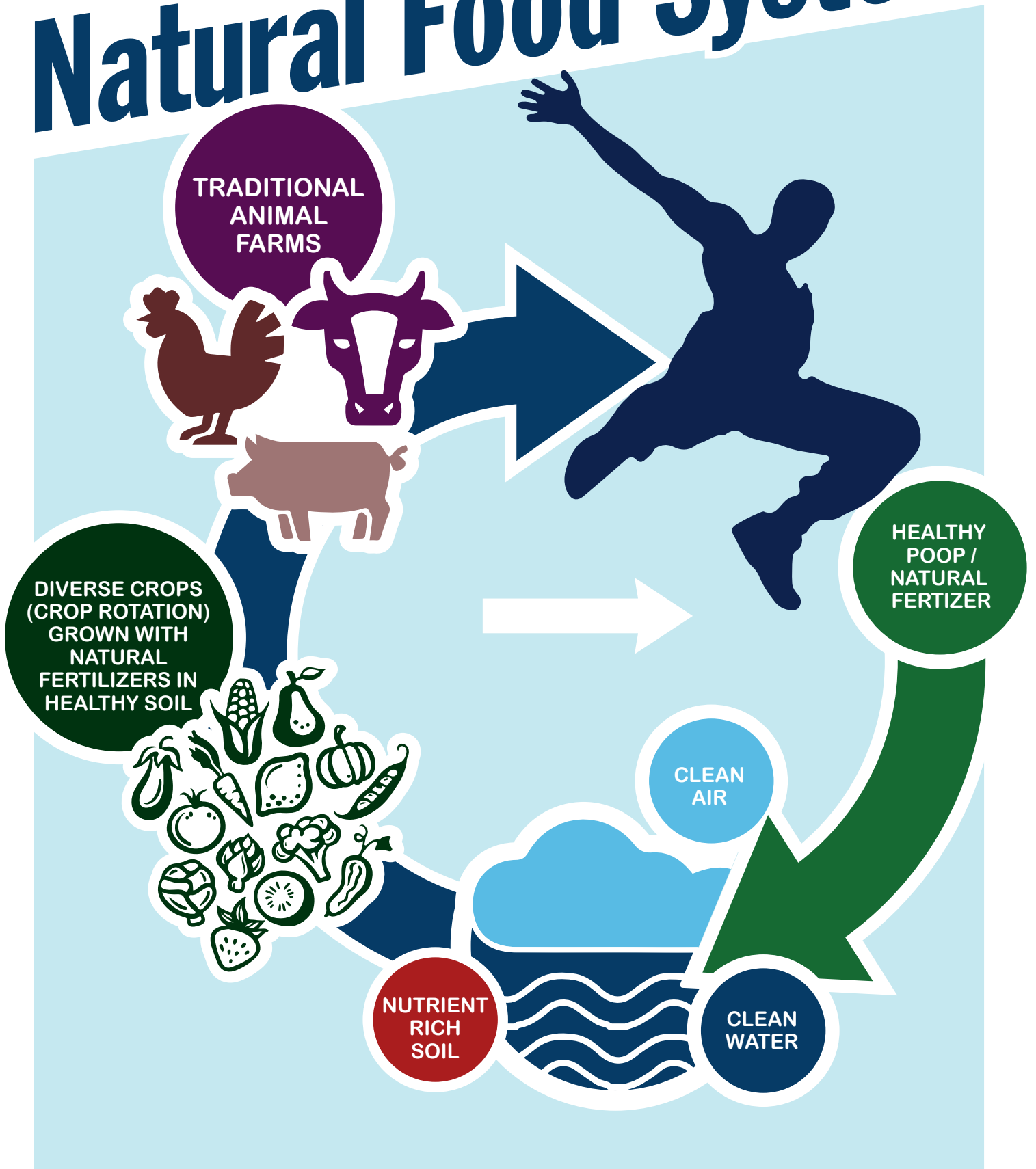
5–8 minutes

Have your students complete the following questions:

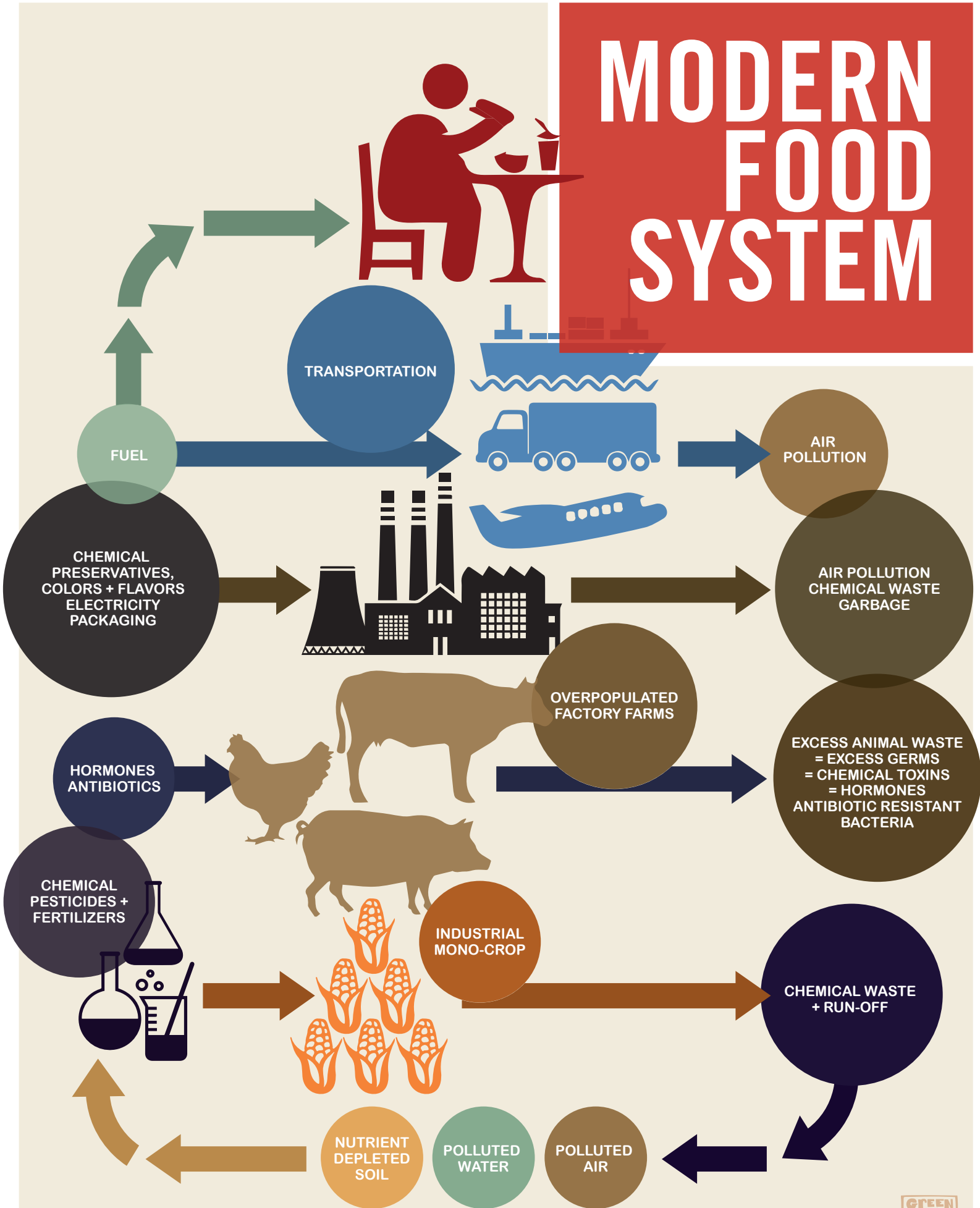
- *What goes into the modern food system?*
- *What comes out of the modern food system?*



Natural Food System

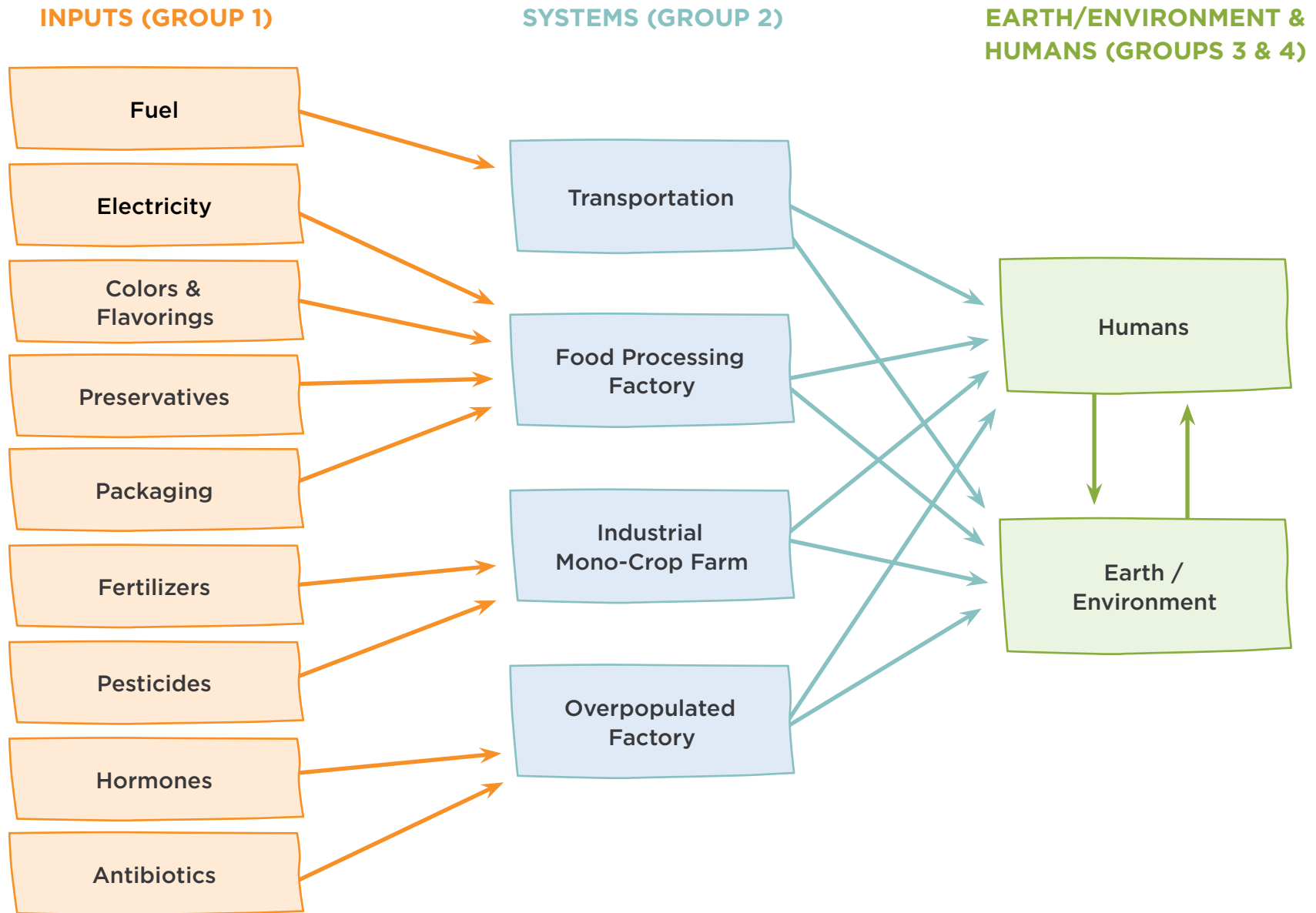


MODERN FOOD SYSTEM





INPUTS & OUTPUTS THEATER ANSWER KEY



ANSWER KEY

Inputs & Outputs Theater Answer Key

The Outputs of:	Effects on: Humans, Environment/ Earth
Transportation	Air Pollution, Water Pollution, Global Warming, Carbon Emissions
Food Processing Factories	Air Pollution, Water Pollution, Global Warming, Carbon Emissions, increased packaging waste in landfills
Industrial Mono-Crop Farms	Air Pollution, Water Pollution, Global Warming, Carbon Emissions, Chemical runoff into waterway – decreasing animal biodiversity such as fish, amphibians, microflora, etc.
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Lesson Extension Essays

INSTRUCTIONS TO STUDENTS

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THE JOURNEY OF FAST FOOD CHICKEN NUGGETS

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healthy pace. Not too fast. Not too slow. Most of these chickens will take about three months to become a full-grown adult. They may become egg-laying hens for a time, or they may be harvested sooner.

When it is time for a chicken to become food, it is killed, cleaned, and brought to a New York City farmer's market or local grocer. If your family buys the chicken at this kind of market, you may even have a chance to talk to the farmer who raised it! There are farmer's markets across the city, so you shouldn't have to travel too far to get it home.

The last part of the story depends upon the recipe. What seasonings does your family like to use? Will it be roasted in an oven or a slow-cooker? Will you roast it with vegetables? Which ones? If you pay close attention or help while it is being prepared, you will know exactly how the last chapter goes. You will know, because you are an important part of this story!

Lesson Extension Essays

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4. Draw a diagram or picture showing the different steps along the way from farm to your Plate.

Compare these 2 food journeys:

ORGANIC BROWN RICE

vs.

FRENCH FRIES



THE JOURNEY OF ORGANIC BROWN RICE

What's the big deal about organic foods? Organic farming can help out Mother Nature and help out the people who eat the food, too. Organic brown rice is a great example as it makes its way from the farm to your plate.

Rice is a water plant, so the farmland must be flooded. At first look, this can seem like a lot of water. The good news is that when the rice is ready to harvest, the water is returned to the surrounding streams and rivers. Also, the flooded farmland creates wetland habitat that is perfect for many kinds of birds and other animals. Organic farming means that chemical fertilizers and pesticides are not used. Therefore, the animals are able to safely drink the water. The water that is drained into the nearby streams and rivers will be free of chemicals, as well.

After draining the water off of the land, the rice is harvested with special farm equipment called harvesters that remove the grains from the plants. The rice is loaded into trucks and taken to nearby mills to dry. After the rice is dry, the hulls are taken off. Hulls are hard shells on the outside of the grains of rice. What is left

is brown rice. White rice requires extra steps to remove more parts of the grain. Brown rice does not go through the extra steps. The outer layer called the bran is left on the rice. Brown rice also retains the part of the seed that could sprout into a new plant called the germ. The bran and the germ are full of nutrients.

Finally the rice is packaged and put onto trucks to take to markets across the country. Most rice is grown in California and a few southern states, so this can be a long journey to get all the way to New York! The best part of organic brown rice is that the rest of the story is up to you. You decide how it gets to your plate! After boiling the rice in water, you can eat it plain. The bran and the germ give it more flavor than white rice. If you like, a little dash of seasoning or a pat of butter can add variety. Either way, you can eat your meal knowing that it will provide lots of tasty nutrition for you and healthy habitat for other animals.

Compare these 2 food journeys:

ORGANIC BROWN RICE
vs.
FRENCH FRIES



THE JOURNEY OF FAST FOOD FRENCH FRIES

Who doesn't enjoy the salty crunch of a hot French fry? When you go to your favorite fast food restaurant, no matter where it is, you know you can count on the fries to taste just right. How do they get them perfect every time? What is the story behind the fast food French fry?

There are over 4000 kinds of potatoes grown in the world. Your fast food French fries are made from only four kinds. These four kinds of potatoes make perfect fries that are crispy on the outside and fluffy on the inside. Fast food restaurants buy a lot of potatoes. In fact, the demand is large enough that most potato farmers in the US only grow these four kinds in large monocultures.

Potatoes are strong plants that will grow in cold and dry areas. Potato farmers in other parts of the world do not even need to water their fields! Fast food French fry potatoes have to be perfect, though. The only way to make sure that the potatoes are exactly the same is to water the plants for part of the year. In addition to using extra water, the farmers use chemical pesticides. Once the potatoes are grown, they are dug up using large farm equipment and trucked to French fry processing plants.

The French fry processing plant is a maze of conveyor belts and tubes where the potatoes ride from one step to the next. To get the perfect French fry cut, the potatoes are shot through a special knife at 60-70 miles per hour! The perfect slices are mixed together with many ingredients, including a sugar that helps create the perfect golden color. They also add a chemical called sodium acid pyrophosphate to keep the fries from turning gray. Finally, the fries are partly fried in a vat of three kinds of oils and other ingredients. One of the ingredients is a chemical to keep the mixture from foaming. The partially cooked fries are frozen, packaged, and trucked to fast food restaurants across the country, sometimes hundreds or thousands of miles. That's a lot of gasoline!

To finish the cooking, the fries are deep fried in an oil mixture at the restaurant. This oil mixture also includes the chemical that prevents foaming. They are salted and served to you piping hot. Thanks to a few chemicals along the way and a strict system that requires consistency at every step, you know exactly what to expect when you bite into that crispy, golden fry.

Lesson Extension Essays

INSTRUCTIONS TO STUDENTS

1. Compare and contrast the 2 stories and discuss which one sounds better. Why?
2. Highlight 2-3 things from the essays that SURPRISED you.
3. Circle 1-3 things from the essays that you have a QUESTION about or write them on the back of the essay handout.
4. Draw a diagram or picture showing the different steps along the way from farm to your Plate.

Compare these 2 food journeys:

SODA

vs.

HOMEMADE LEMONADE



THE JOURNEY OF SODA

“What would you like to drink with your meal?” It seems like a simple question, but have you ever really thought about where your drink comes from? It isn’t like there is a soda tree somewhere growing soda fruits that someone can squeeze the soda juice out of. So how do they make the fizzy, sweet drink that is added to so many fast food meals? The story of soda might surprise you.

The story of soda starts out in an unexpected place: the corn field! The United States produces more corn than any other crop, and most of it is grown in Iowa and Illinois. Many other states in the Midwest also grow large fields of corn. This corn is grown in huge fields. Corn farmers use chemicals that can lead to water pollution from fertilizers and pesticides. But what does this have to do with soda? One of the main products of corn is high fructose corn syrup. It is the second ingredient, after water.

To make high fructose corn syrup, the corn is harvested by large machines called combines and trucked to factories. In the factory, the corn is ground up and starches are separated out. Starches are then mixed with chemicals called enzymes that break them down into sugars

called glucose. This glucose is regular corn syrup. The corn syrup is treated with two more kinds of enzymes that change some of glucose into fructose, a sugar that tastes even sweeter. This mixture of glucose and fructose is called high fructose corn syrup.

The high fructose corn syrup is packaged and trucked to soda plants across the country. Then it is mixed with water that has been filtered and purified. Other chemicals are also added for flavoring and as a preservative. The ingredients are measured very carefully by machines, and then the liquid is made fizzy by adding carbon dioxide. The soda must be poured into bottles or cans and sealed quickly. The bottles or cans may be packaged in boxes before being trucked to stores and restaurants for people to enjoy.

But what if someone wants soda out of a soda machine? The high fructose corn syrup, flavors and other chemicals are mixed together at the soda factory. The flavored syrup is packaged and trucked to the restaurants. Soda machines in the restaurant carbonate the water and add the syrup right before it flows all the way from the corn fields into a paper cup.

Compare these 2 food journeys:

SODA

vs.

HOMEMADE LEMONADE



THE JOURNEY OF HOMEMADE LEMONADE

Sometimes you just want to treat yourself to a cool drink. You could go with soda, but what are all of those strange words on the ingredients list? Maybe you should make it with your own hands, so you know exactly what's in your drink. Lemonade might be the perfect idea. But how much do you really know about the lemons? How does a glass of ice cold lemonade make it to your table? What's the story?

In the United States, almost all lemon orchards are in California and Arizona. A fun fact about lemon trees is that the tree trunk may be from a different kind of tree than the branches and fruit! Tiny buds from the fruit tree are added onto the trunk of a different baby tree. This process is called grafting. Grafting creates a tree with the good qualities of both trees. The branches produce the desired fruits, and the trunk might be one that is less likely to get sick. Lemon farmers may still use chemical pesticides, but they use less thanks to grafting.

There are a few challenges to lemon farming. Lemons can grow in most kinds of soil. However, even sandy soil must have nutrients. Lemon growers often use chemical fertilizer to add these nutrients. The good news is that California soils require less fertilizer than other citrus growing areas. Also, lemon trees freeze easily. Wind machines are used to blow warm air down

from above to keep orchards warmer longer during cool nights. In the past oil-burning heaters were used, but the fuel is too costly for most lemon farmers these days.

Lemons are picked by hand year round and carefully loaded onto trucks to be taken to nearby packing houses where they are sorted and washed. Washing the lemons removes their natural wax, so they are coated in an edible wax. The wax helps keep the lemons juicy and fresh. Other chemicals are also added to stop insects and fungus from ruining the fruit. Lemons that are too small, too large, or bruised are sorted to be sent to juice plants. The best lemons are sorted out to be sold as whole lemons. These are packed in 40 pound cartons and shipped via truck or train to be delivered to markets across the country.

The best part of making your own lemonade is that the rest of the story is up to you! Once you buy the lemons and bring them home, you can wash off the waxes and chemicals with a vegetable scrub brush. You decide how much sugar to add so that it is just the right flavor and not too sweet. Pour it over some ice, and enjoy your well-earned treat!

Environmental Impacts of the Modern Food System: Part 1 - Video Worksheet

Name: _____

Date: _____

Read the questions before you watch the video. You can jot down your ideas as you watch or wait until the end.

1. What is an example of environmental impact?	
2. What is the difference between a local market and supermarket and between a farm and super farm?	
3. What does he mean by “mechanization”?	
4. What is maximum production, mass distribution, and mass consumption?	
5. What does he mean when he says “at a massively unsustainable rate where natural resources get used and contaminated”?	
6. Why might animals be injected by hormones or antibiotics?	
7. What makes the conditions of a “factory farm” “unnatural”?	
8. What are the effects of a factory on the environment?	
9. What does he mean when he says “nothing can live on the land when nothing can live <i>in</i> the land. Nothing can live on the land when nothing can live <i>off</i> the land. Nothing can live on the land when the land is a landfill...”?	
10. How did the super system become a super problem?	

Environmental Impacts of the Modern Food System: Part 1 - Video Worksheet

Answers

1. What is an example of environmental impact?	The effects on our land and waterways
2. What is the difference between a local market and supermarket and between a farm and super farm?	<ul style="list-style-type: none"> • Small and individual like a “farmer’s market” vs. a really large market (like Keyfood). • Family farm vs. factory or really big farm
3. What does he mean by “mechanization”?	Like a factory; machines doing the work on an assembly line to increase speed and quantity; people are not as involved in the work
4. What is maximum production, mass distribution, and mass consumption?	<p>Mass production: A large amount of food being prepared</p> <p>Mass distribution: The ability to sell the product to a huge amount of people</p> <p>Mass consumption: A huge number of people eating the products</p>
5. What does he mean when he says “at a massively unsustainable rate where natural resources get used and contaminated”?	<p>We can’t keep this system up; it’s harmful to environment:</p> <ul style="list-style-type: none"> • Massive - huge • Unsustainable - can’t keep it up • Rate - how fast it is happening • Natural resources - water, trees, etc. • Contaminated - ruined or poisoned
6. Why might animals be injected by hormones or antibiotics?	Because of overcrowded conditions, animals are more likely to get sick; medicine helps them stay well; hormones allow them to grow bigger, quicker and, produce more, which saves time and money
7. What makes the conditions of a “factory farm” “unnatural”?	There isn’t enough space for animals to roam around freely as they would on a family farm; they are given medicine and hormones, which they wouldn’t need if they weren’t in a “factory” farm
8. What are the effects of a factory on the environment?	Resources are depleted; trees chopped down; air and water polluted, toxins seep into land/water, smoke from factory, etc.
9. What does he mean when he says “nothing can live on the land when nothing can live <i>in</i> the land. Nothing can live on the land when nothing can live <i>off</i> the land. Nothing can live on the land when the land is a landfill...”?	When land is polluted and abused by factory farm processes, then nothing can grow as it should
10. How did the super system become a super problem?	All the negative environmental impacts are super sized as we increase “mass production”

Name: _____

Date: _____

Environmental Impacts of the Modern Food System: Part 1 - Exit Card

1. What are the cons (negatives aspects) of the modern food system?

Name: _____

Date: _____

Environmental Impacts of the Modern Food System: Part 1 - Exit Card

1. What are the cons (negatives aspects) of the modern food system?

Name: _____

Date: ____

Environmental Impacts of the Modern Food System: Part 2 - Exit Card

1. What goes into the modern food system?
2. What comes out of the modern food system?

Name: _____

Date: ____

Environmental Impacts of the Modern Food System: Part 2 - Exit Card

1. What goes into the modern food system?
2. What comes out of the modern food system?
