



Growing the Food We Need



With over 7.5 billion people living on our planet, growing enough food for everyone is a challenge. Farms, both in the countryside and in urban centers, are incredibly important. Without them, cities as we know them today would not exist.

In Unit 3, you will explore the essential resources for growing our food and the impact our food choices have on the environment. You will also learn how food is grown in cities, and the people and innovations that make this possible. For your unit project, you will design an innovative and sustainable farm for your city.

Vocabulary



AGRICULTURE (noun)

The practice of growing crops and raising animals for food.
Example: Cities depend on agriculture for most of the food they eat.



CLIMATE (noun)

The temperature and weather patterns of a place.
Example: Some places have a hot and humid climate.



CROP (noun)

Plants that are grown for people and animals to eat.
Example: The farmer grew different crops such as cucumbers, tomatoes, and corn.



EFFICIENT (adjective)

Working without wasting time, resources, or energy.
Example: Our new efficient light bulbs need less electricity to produce light.



FOOD SECURITY (noun)

Having access to a constant supply of healthy, nutritious food.
Example: The school provided free breakfast to students every day to improve food security.



FOOD SYSTEM (noun)

The steps involved in producing food: growing, processing, transporting, selling, buying, consuming, and disposing of food.
Example: The global food system makes it possible to buy fruit that grows in faraway countries.



INNOVATION (noun)

A new tool or way of doing something.
Example: The vertical farm is an innovation that helps people grow food in cities.



SUSTAINABLE (adjective)

Taking care of people's needs without harming the environment, such as by using fewer resources.
Example: Farmers who practice sustainable agriculture find ways to grow food using less water.

VOCABULARY CHALLENGE

For each blank, choose a word from the list above. Look for clues to help you decide!

The global _____ depends on people who work in _____.

Each _____ that is produced grows best in its own special _____. To keep our food system secure, people are creating new _____ to help us grow the food we need in a more _____ and _____ way. These innovations improve _____ in communities around the world.

1 Where Food Begins

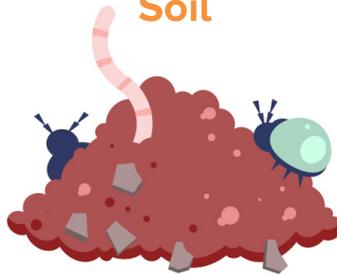
Everything we eat begins with three things—seeds, soil, and water. These are the foundations of all food on our planet. Even animal products such as milk, eggs, cheese, and meat would not be possible without them. To keep our food supply **sustainable**, humans need to take care of these three limited resources.

Seeds



Did you know there are millions of **crop** varieties on Earth?* The seed for each crop holds unique genetic material that determines a plant's characteristics, such as the ability to grow in different **climates** and its nutritious qualities.

Soil



Soil is incredibly complex! It's made of decomposed plants, decomposed insects, air, water, healthy bacteria, minerals, sand, and clay. Many of the minerals that make our food nutritious come from the soil.

Water



Only about 1% of Earth's water is available for drinking or farming. Most of it is saltwater or trapped in glaciers.* Keeping our water supply safe and clean is important for a sustainable food supply.

What Else Is Needed?



INSECTS—Insects in the soil decompose old plant matter and create manure to enrich the soil. Bees, butterflies, and beetles pollinate plants so that they produce fruit and seeds.



LABOR—Over one billion people work in **agriculture**.* Unfortunately, that number is decreasing despite our growing need for food. Farmers and farm laborers are valuable to our **food system**. Without them, we wouldn't be able to feed our cities.



FUEL AND MACHINERY—On many farms, tractors and other machines have replaced human and animal labor. Fuel and machinery are a cost to farmers and have a negative impact on the environment.



CLIMATE—Each kind of plant requires a unique climate for it to grow. Unexpected weather such as floods or droughts affect our ability to grow crops. Rising pollution levels in the form of carbon dioxide (CO₂) and methane, affect the climate as well. To learn more, check page 58.

*Source: FAO Statistical Yearbook: 2012. Food and Agriculture Organization of the United Nations.

Research: Where Food Begins



Choose a **crop** that you eat often, such as a fruit, vegetable, bean, nut, or grain. What type of soil and how much water does it need to grow? What does its seed look like? Answer the questions below by speaking to a farmer or gardener, or by researching online.

Crop



Seeds

How does this crop make its seeds? What does the seed look like?



Soil

What nutrients need to be in the soil to make this plant healthy?



Water

How much water does this crop need? Where does the water come from?

Choosing Reliable Sources

You can't trust everything on the internet. Here's how to make sure you choose websites you can trust:

- Is the author trustworthy?**
 The author of a website can be a person, organization, school, or university. Look for information about the author to find out if they are an expert.
- Is this the information I need?**
 Look for websites that answer your research questions. The information should be factual (not opinions) and easy to understand.
- Is the site up to date?**
 Check the date of the information you are reading. Reliable information is updated regularly.



Global Discussion: Where Food Begins



Work individually or in small groups to write a discussion post about your **crop** research. What did you learn? Share pictures of the crop and how it is grown. Tell your international peers about the popular foods in your city that are made with this crop.

Subject



Use the **photo icon** to add pictures of the plant and its seed.

Hi everyone,

I researched

To gather information, I

I learned that

This crop is used to make

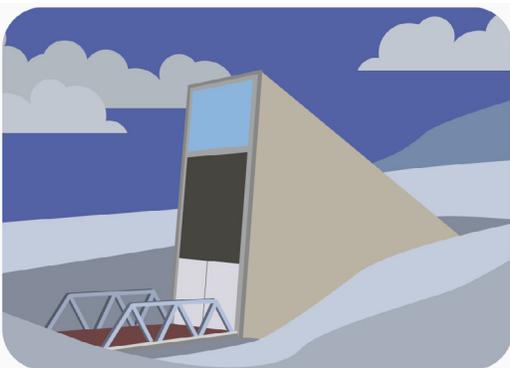
Sincerely,

Upload a File

Post

Save Draft

Cancel



Learn More: The Norway Seed Vault

The Svalbard Global Seed Vault is located in Norway, on an island north of the Arctic Circle. The vault stores 500 seeds for each of the nearly one million crops it holds so far, with the goal of collecting seeds from 4.5 million crop varieties. The vault is designed to keep seeds, the source of the planet's food, secure despite climate change and natural or human-made disasters.

Source: Svalbard Global Seed Vault, Crop Trust, 2017.

2 A Water-Wise Meal

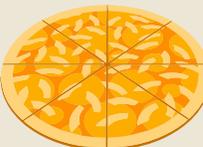
Water is one of the three foundations of food, and some **crops** and animals are thirstier than others! A water footprint is the amount of water needed to produce crops and to process the food.

You might be surprised by the water footprint of some of your favorite meals. The average water footprint of a cheese pizza is 1260 liters (nearly 333 gallons)!* The water footprint of animal products includes the water the animal drinks and all the water needed to grow the crops that the animal eats in its lifetime. This makes animal products the thirstiest of all!

Read the Water Footprint Menu below to learn how much water is needed to produce the foods you enjoy. Are any of your favorite foods thirstier than you thought?

Water Footprint Menu

 = 1 liter (or 0.26 gallons)

| Main Dishes | | Sides | | | | | |
|---|-------------------------|---|------|--|---|---|-----|
|  | Beef Burger |  | 3000 |  | Bread |  | 274 |
| | Cheese Pizza |  | 1260 | | Green Beans |  | 112 |
| | Rice |  | 375 | | Apple |  | 126 |
| | Chicken |  | 865 | | Banana |  | 160 |
| | Salmon |  | 340 | | Fries |  | 260 |
| | Beans |  | 1000 | | Lettuce and Tomato Salad |  | 112 |
| | Noodles with Vegetables |  | 600 | | | | |
| Desserts | | Drinks | | | | | |
|  | Chocolate 100 g |  | 1700 |  | Soda |  | 75 |
| | Cheese 0.25 kg |  | 795 | | Bottled Water* |  | 3 |
| | Dates 0.25 kg |  | 569 | | Tap Water* |  | 1 |
| | Chocolate Ice Cream |  | 2000 | | Milk |  | 255 |
| | | | | Orange Juice |  | 160 | |
| | | | | Tea |  | 27 | |

Page 1

Page 2

Source: Multimedia Hub, *Water Footprint Network*.

*Source: "The Hidden Water in Everyday Products." *Water Footprint Calculator*, 1 July 2017.

Analyze: A Water-Wise Meal



Use the Water Footprint Menu on page 46 to order two meals. Both your meals must include at least one item from each menu category.

For the first meal, you can order whatever you like. For the second meal, you will need to be more water-wise. The combined water footprint of the foods in your second meal cannot be more than **2000 liters**.

Write your orders below and calculate how much water was needed to produce each meal. Remember,  = 1 liter.

| | Example | Your Meal | Water-wise Meal (≤ 2000 liters) |
|---------------------|--|---|---|
| Main Dish |  <i>Cheese Pizza</i> 1260 liters | | |
| Side |  <i>Green Beans</i> 112 liters | | |
| Dessert |  <i>Chocolate (100 g)</i> 1700 liters | | |
| Drink |  <i>Tea</i> 27 liters | | |
| Total liters |  3099 liters |  |  |

Class Discussion

Compare the water footprint of your two meals, then compare them with a classmate's meals.



Which meal was more water-wise? Why do you think this is true?



Is one of the meals healthier than the other? How does this relate to the meal's water footprint?



How can you change your meal to make it more water-wise?

Read and Reply: Where Food Begins



Read the posts in the **Where Food Begins** discussion. Reply to international posts to share what you learned.

Reply:

[Add subject line](#)

[Add attachment](#)

[Use rich text editor](#)

Dear _____,

Thank you for sharing your research about _____

Your post made me wonder _____

Something I was surprised to learn about the water footprint of food was _____

I can be more water-wise in my food choices by _____

Sincerely,

[Submit Reply](#)

[Save Draft](#)

Career Spotlight: Environmental Scientist

Environmental scientists study the effects of pollution and climate change on our health, work to find **efficient** and **sustainable** energy sources, and manage our planet's natural resources such as forests. They monitor water quality at beaches and make sure our drinking water is safe. They also inform the government about environmental dangers that need to be addressed. Environmental scientists are important to our **food security** because they work to protect the quality of our air, soil, and water, which are essential for growing healthy food.



Environmental scientist surveying soil
Photo by Tim McCabe, USDA Natural Resources Conservation Service

3 Urban Farms

People around the globe are combining new ideas and technology to grow food for cities. Innovations like vertical farms, aquaponics, and hydroponics are sometimes used to create urban farms. Other urban farms make use of a rooftop or unused space.



Rooftop Farm in St. Louis, Missouri, USA
© UrbanHarvestSTL CC BY-SA 4.0

Have you ever seen or visited an urban farm in your city?

Evaluate: Urban Farming Innovations



Watch the videos and presentations on the **Urban Farms** page in the e-classroom, then complete the chart below. Evaluate whether each innovation would be useful in your city.

| Innovation | Benefits | Challenges | Is this innovation useful for our city? Explain. |
|--------------------------------|--|--|--|
| <i>Example: Aquaponic farm</i> | <i>Example: Aquaponic farms use less water and recycle fish waste to provide nutrients for plants.</i> | <i>Example: It is expensive, and you must balance the needs of fish, plants, and microbes for the system to work well.</i> | <i>Example: Yes. We have space for small farms and need to conserve water during the dry season.</i> |



Global Discussion: Urban Farms



This week, you learned about **innovations** that allow us to grow food in cities. Which innovation do you think would be useful in your city and why? Share your ideas in the **Urban Farms** global discussion.

Subject

Hi everyone,

I think a useful urban farming innovation for my city would be because

This innovation makes growing food more sustainable and efficient by

To convince people in my city that this innovation is a good idea, I can

Sincerely,

Upload a File

Post
Save Draft
Cancel

Learn More: Make Your Own Soil!

Did you know that food scraps such as vegetable peels and apple cores are valuable to **food security**? Food waste from plants can be turned into soil that will grow healthy and nutritious food. This process is called composting. To create a compost pile, you will need a bin or place to build a pile outdoors, and “brown” and “green” plant materials. Brown materials include dry leaves, straw, or sawdust. Green materials include fruit and vegetable scraps. Put down a layer of green material, then cover it with a layer of brown material. Repeat this process each time you want to add to the compost pile. Keep the pile moist, but not too wet. Turn the pile over to add oxygen. The pile will heat up as good bacteria get to work digesting the materials and creating soil. Microbes, worms, snails, insects, and fungi help in the process, too. In six to nine months, you could have some amazing soil for your garden!



Compost Bin Tube
© Ellen Levy Finch CC BY-SA 4.0

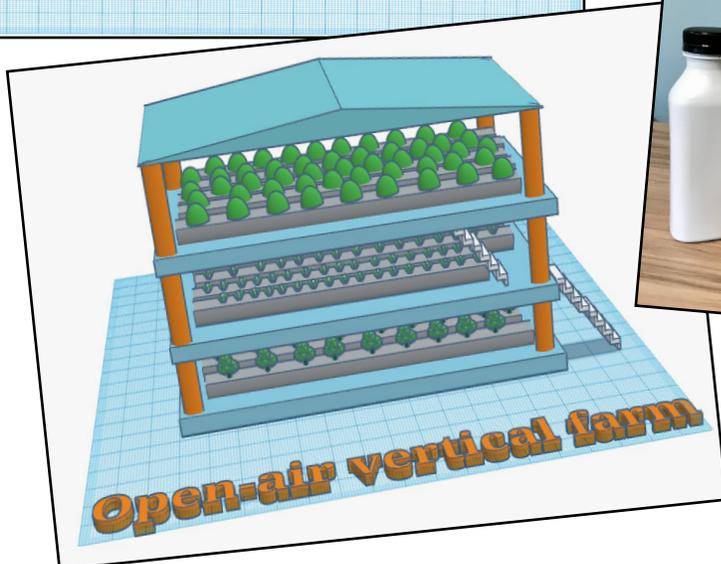
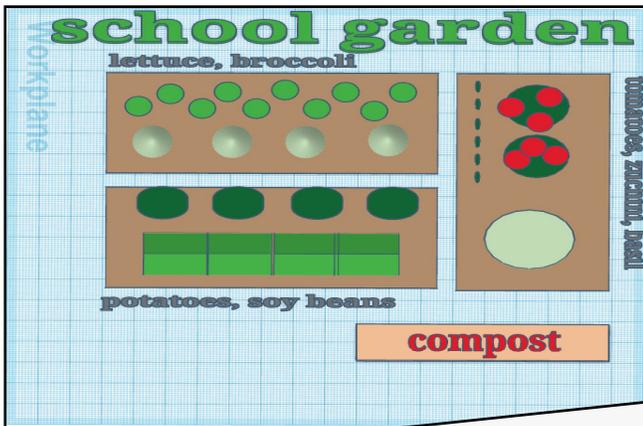
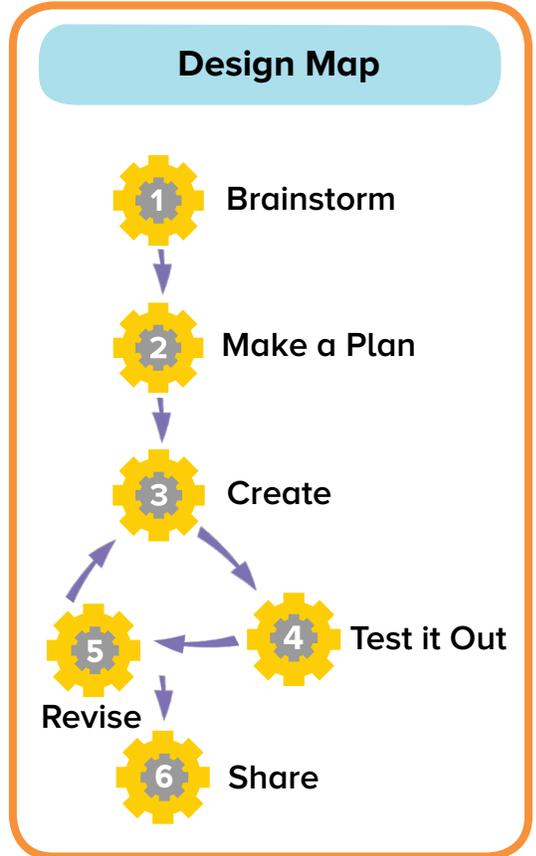
4 Digital Project: A Farm for My City

More and more, people in cities are thinking about ways to improve **food security**, and creating urban farms using **innovations** in **agriculture**.



For your Unit 3 digital project:

- ✓ Work in groups
- ✓ Choose a location for your farm
- ✓ Choose a farming innovation or method
- ✓ Choose crops for your farm that fit your climate and culture
- ✓ Choose how you will care for your soil and access water
- ✓ Create a 3-dimensional (3D) model using a digital tool such as Tinkercad or recycled materials. (see images below)

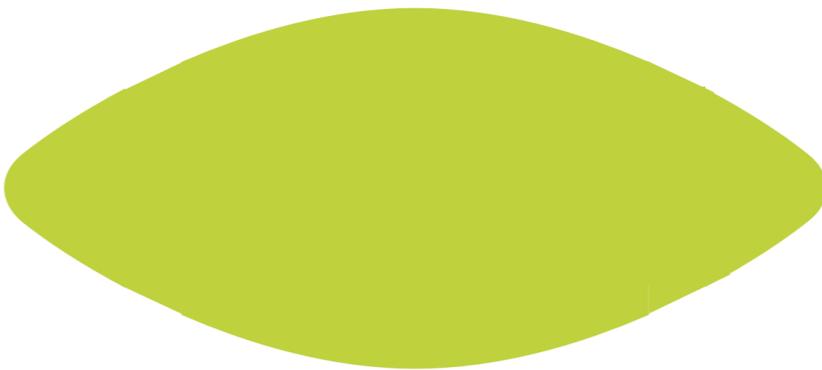




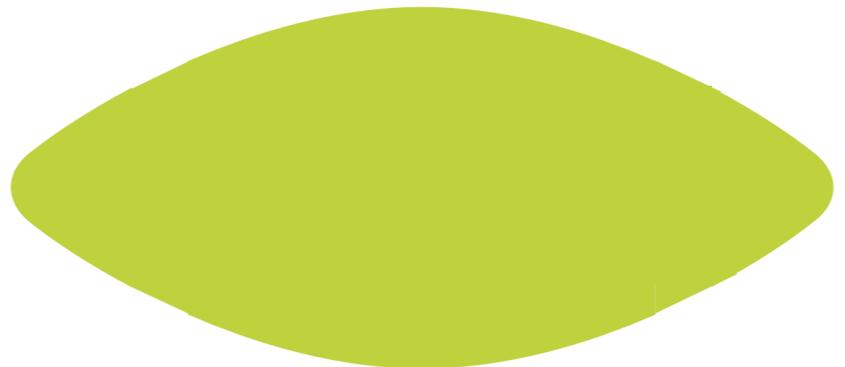
Brainstorm



1 What unused spaces in your city could be transformed into a place to grow food? Name a few possibilities.

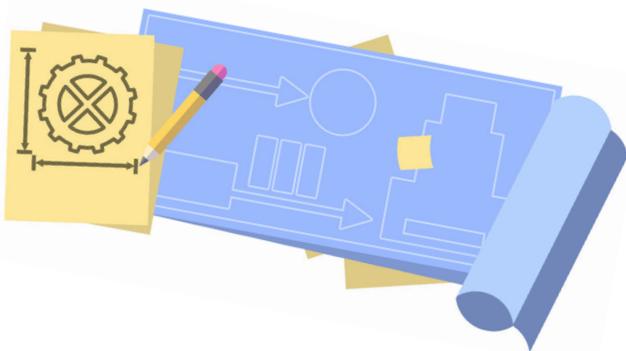


2 Which type of urban farm **innovation** would be helpful in your city? Think of all the ones you know.



3 Think about the climate in your city. Which **crops** grow best in your climate, or in the urban farm you have chosen? Remember to choose several crops for a variety of foods.

4 Get some paper and draw what your farm could look like! Watch the “How To Sketch” video in the e-classroom to get you started.





Make a Plan

Now that you have brainstormed, decide what your final choices for your project will be. Remember your whole group must agree on these decisions.

1. My group will create:

A digital 3D model

A physical model using recycled materials

2. The location of our farm

3. The **innovation(s)** for our farm

4. The **crops** we will grow and why we chose them:

5. The resources, soil, and **climate** we need:

6. We will get our water from:

7. This farm will improve access to healthy food in our school or neighborhood by:



Read and Reply: Urban Farms



Return to the **Urban Farms** discussion board and write replies to your peers. Did you have similar or different ideas about which innovation would be useful in your city? You can also share ideas for your urban farm model.

Reply:

Add subject line

Add attachment

Use rich text editor

Dear _____,

I thought the innovation you shared was interesting because

My group is planning to use *(innovation)* in our urban farm model because

What do you think about our urban farm plan? I want to ask your advice about

Sincerely,

Submit Reply

Save Draft



Thinking About Perspective

A person's perspective is made of their attitude, beliefs, and opinions. It is influenced by where that person lives, what they have experienced, and the ideas they have heard. When you write your reply in the discussion board, use the sentences below to learn more about perspective:

- ✓ "Could you please explain more about..."
- ✓ "What you said is different from my experience because..."
- ✓ "I am interested to know why you..."
- ✓ "If I understand it correctly, you are saying..."





Create

Create a 3D model of your farm. You can use a digital tool such as Tinkercad, draw a 3D model, or build a model with recycled materials.

Your Unit 3 project must include:

- A location for your farm
- A farming innovation
- Crops for your climate and culture
- Reflections on how you will care for your soil and access water
- A 3D model using a digital tool or recycled materials



Test It Out

Share your design with someone outside of your group to get feedback:

- ✓ Is our model easy to understand? Does it have enough labels or details?
- ✓ What's missing? Are there other elements we need to include to make sure our model is complete (innovation, crops, water source, etc.)?
- ✓ Did we make good use of the space we chose for our urban farm?
- ✓ Would people in your city eat the crops from this farm? Why or why not?



Revise

Discuss your ideas before editing your presentation:

- ✓ Add, change, or remove details to make your model more informative and interesting.



Learn More: Harvest Celebrations Around the World

Many cultures celebrate the crop harvest each year. These celebrations may look different, but share similar qualities, such as eating special foods. Learn about three harvest celebrations in different regions of the world.



Mooncakes

The Mid-Autumn Festival in China and East Asia is sometimes called the Moon Festival. It is celebrated in the eighth lunar month of each year during the full moon. Mooncakes are a popular treat during this harvest celebration. Mooncakes are pastries with fillings like sweet bean paste or roast pork.*



Fried Yam

© Kwabena CC BY 3.0

People in Ghana celebrate the annual harvesting of yams with the Yam Festival, usually in September. As you might expect, yam dishes are traditionally eaten during this festival. The Yam Festival is also a celebration of family, community, and unity with music, drumming, storytelling, and a shared meal!**



Thanksgiving Plate

In Canada and the United States of America (USA), Thanksgiving is a time to gather with loved ones to share a harvest meal. Typically, the meal includes roast turkey and root vegetables, like potatoes and yams. The USA celebrates this holiday in November, while Canada celebrates in October.

Does your city have a harvest celebration? How do you celebrate?

*Source: "Chinese Mid-Autumn Festival." *British Council: SchoolsOnline*.

**Source: Williams, Sheila. "The Unforgettable Yam Festival." *Business Day Ghana*, 4 Jul. 2017.

Global Discussion: Share



You've worked with your small group design a farming solution for your city! Share your 3D farm model with your international peers. Attach a photo or embed your design in the *A Farm for My City* e-classroom discussion.

Remember! Post only one project for each group.

Subject

Dear peers,

Our urban farm is located in _____.

We will grow _____ . We picked these crops because _____.

We decided to use _____ as our innovation because _____.

We will take care of the soil and access water by _____.

Our farm improves the local food supply by _____.

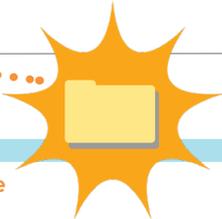
Sincerely, *(names of all group members)*

Upload a File

Post
Save Draft
Cancel



Use the **photo icon** to add a picture of your urban farm design.



Click the **Upload a File** button to attach your project to your post.



What Does Food Have to Do with Climate Change?

In our food system, everything is connected. The way we grow food and the types of food we eat affect the climate. In turn, the climate affects our ability to grow food! You may have heard the term “greenhouse gasses”. Greenhouse gasses get their name because they trap heat in Earth, making the planet warm up like a greenhouse. When our planet warms up, weather patterns change. This leads to droughts, flooding, and other unexpected changes in weather that make it challenging to grow food. Certain human behaviors cause an increase in greenhouse gasses in the environment. For example:



Deforestation in Nigeria

© English: Foreign and Commonwealth Office (Flickr) OGL

Cutting down forest to make room for farmland and cities means fewer trees to absorb greenhouse gases.

Animals have a large water footprint. Their waste releases a greenhouse gas called methane. The more people demand animal products, the more greenhouse gases increase.



Household food trash in New York, USA

© petr CC BY 2.0

Waste affects the environment, too. When we throw food, paper, plastic, and even clothes in the trash we are throwing away the resources it took to produce

What can we do?

Our actions make an impact. Eat fewer animal products or participate in Meatless Mondays! It also helps to use only what you need, or to re-use what you already have. When you can't use an item any longer, find a way to recycle it or use it to create something new!

What will you do to make an impact?

6 Give Feedback



You've seen urban farms from other cities in your collaboration. What did you learn? How could these urban farms and innovations be useful in your city? Work with your group to give feedback to your international peers.

Reply:

Add subject line

Add attachment

Use rich text editor

Dear _____,

Thank you for sharing your urban farm design. We thought you did a great job with

We think your farm could work in our city if

We would like to suggest that

Something else I would like to know about your farm is

Sincerely,

Submit Reply

Save Draft

Giving Feedback

Use these phrases to help you give good feedback:

- ✓ I really liked your project because...
- ✓ I think you could improve your farm by...
- ✓ Have you thought about...?
- ✓ Could you tell me more about...?
- ✓ I think your farm will work well in my city, too, because...



