

UNIT 3 | HOW MANY IS ENOUGH?

EARTH: THE APPLE OF OUR EYE

METHOD

An apple is sliced into pieces to model the amount of agricultural land being used on Earth while students track data on a pie chart.

MATERIALS

- Apple
- Knife
- Cutting board
- Pie Chart Tracking Sheet (provided)
- Markers
- Rulers
- Article: "[Do we treat our soil like dirt?](#)"



NOTE: If you would rather not use an apple and knife, use a ball of Play-Doh and dental floss.

INTRODUCTION

There are approximately 8 billion people living on the planet, and we all need food in order to survive. Whether fruit, beans, cheese, cereal or meat, the food we eat originates in the soil. As the global population grows, there will be more demand for food as well a greater need for healthy soil to grow that food. Already, half of all the **habitable land** on Earth is used for farming, and much of that **agricultural land**, about 75 percent, is used to raise livestock like cows, pigs, and sheep. Land used for livestock includes space for animal grazing and as well for growing crops like corn, oats, and barley that go into animal feed.

To feed our growing population in a sustainable way, we must keep the farmland we are currently using healthy and minimize the amount of land that will need to be converted from wild lands to farmland in the future. Protecting soil from erosion, reducing pollution of land, air and water, and reducing our consumption of meat and dairy can all help to preserve our current farmland while saving as much land as possible for other important uses, like wildlife habitat.

PROCEDURE

1. Before class, print copies of the National Geographic article "[Do we treat our soil like dirt?](#)" at the appropriate text level for your students (adjust using the grade level buttons at the top of the article).



CONCEPT

Half of the habitable land on Earth is used for food production, and it is important to preserve agricultural land in order to feed a growing population.

GRADE LEVEL

Upper elementary

SUBJECTS

Science, Social Studies, Math

OBJECTIVES

Students will be able to:

- Describe Earth's geography in terms of relative amounts of water, inhospitable land, habitable land, and land being used for farming.
- Apply knowledge of fractions to create a pie chart showing how the features of Earth's surface are divided.
- Identify two reasons why protecting agricultural land and maintaining healthy soil is important for food production.
- Describe at least two ways people can help preserve agricultural land.

SKILLS

Using fractions, creating a pie chart, observing, problem solving, reading and comprehending informational text, understanding cause and effect

Apple	Earth	Narrative	Pie Chart
1/12 peel	Topsoil of agricultural land	Carefully remove the peel from the 1/12 slice of 'agricultural land' from the last step. Hold out the peel. "This peel represents topsoil – the soil right on the surface of the Earth in which plants grow."	
1/48 peel	Land used to grow crops directly for humans (doesn't include livestock)	Say, "But not all of the crops grown in this soil are being used in the same way." Cut the peel crosswise into 4 equal pieces and hold up one piece (1/48 of the whole apple's peel). "This is the amount of our farmland that is being used to grow crops like beans, fruits, vegetables and grains that get harvested for humans to eat. What fraction of our farmland is this?" (1/4)	Students divide the remaining 1/12 of the pie chart crosswise into 4 equal sections. Students label 1 of those 4 sections as cropland for humans.
3/48 peel		Ask, "What do you think the remaining agricultural land is used for?" "The remaining 3/4 of agricultural land is used for livestock like cows, pigs, and sheep. This land is used for grazing, where livestock eat grasses and other plants, and also to grow crops like corn, soybeans, oats, and barley that go into livestock feed."	Students label the remaining 3 sections (3/48 of the pie chart) as cropland for livestock.

If you want to reinforce the math concepts from the apple-cutting demo, have students work on one or more of the questions from the "Math Extension Bank" below. The extension questions can be worked on individually or in small groups.

Math Extension Bank

- Write a formula to express how the Earth's land is divided. (*Option 1: $\frac{1}{3}$ inhospitable + $\frac{1}{3}$ habitable but not used or crops + $\frac{1}{3}$ agricultural; Option 2: $\frac{2}{3}$ habitable + $\frac{1}{3}$ inhospitable; Option 3: $\frac{1}{48}$ crops for people + $\frac{3}{48}$ farming land for livestock + $\frac{1}{12}$ habitable but not used for farming + $\frac{1}{12}$ inhospitable*)
- Write an equation using $<$ or $>$ to show how two different features of the Earth surface compare in size.
- Write a math story using at least five fractions or percentages to explain how the Earth's surface is divided. Teacher note: If necessary, provide a 'Fraction Bank' that includes the following fractions: $\frac{1}{4}$, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{12}$, $\frac{1}{6}$, $\frac{1}{48}$, $\frac{3}{48}$

Sample story 1: $\frac{1}{4}$ of the Earth's surface is land. $\frac{1}{3}$ of all the land on Earth is inhospitable and can't grow crops. Also people can't live there. Of the land where people can live, $\frac{1}{2}$ is used for crops. The other $\frac{1}{2}$ is forest and land that people are using for things like roads and houses. When you look closely at our cropland, you see that only $\frac{1}{4}$ of it is used for food that humans eat straight from the farm. The other $\frac{3}{4}$ of cropland goes to grazing and feeding livestock that eventually get eaten by humans.

Sample story 2: $\frac{1}{4}$ of the Earth's surface is land and $\frac{3}{4}$ is water. $\frac{1}{12}$ of Earth's surface is too harsh for people to live and for people to grow crops. Another $\frac{1}{12}$ is covered in forests and things like roads, schools, and houses. The last $\frac{1}{12}$ is land that is used to grow crops.

- We used an apple as a 3D model of the Earth. Can you think of a way to show the divisions we made using a different method?

9. Distribute a copy of the article "[Do we treat our soil like dirt?](#)" to each student. While they read the article, they should use their markers to highlight threats to the world's soil and underline things that can be done to protect the world's soil.
10. After reading, have students pair up to compare the threats and protections that they identified in the article.

DISCUSSION QUESTIONS

1. What are some foods you eat every day that are grown directly in the soil? What are some foods that come from livestock?

Answers may include: grains (like rice, wheat for bread, and corn for cereal), apples and other fruits that grow on trees, carrots and other vegetables, spinach and other green, leafy plants. All meat and dairy products come from livestock, including burgers, steak, ham, hotdogs, chicken, cheese, yogurt, milk, etc.

2. Are there examples of agricultural land in your community? Or examples of agricultural land you've seen somewhere else? What do these spaces look like?

Answers will vary.

8. Earth's topsoil is generally 5-10 inches deep. It can take up to 1,000 years for about one inch of topsoil to form. Why is it important to preserve the topsoil on our agricultural land? Can't we just expand agricultural land into habitable land that's not currently being used for agriculture?

Because top soil takes so long to form, if the soil on agricultural land becomes damaged, polluted, or erodes away, we may need to expand into areas being used for other things. Most of the habitable land not being used for farming is covered in rich wild lands (forests and shrub land) that support a diversity of plant and animal wildlife. Converting this wild land to crops for humans or livestock would harm important ecosystems. Forests are also critical in filtering the air and helping to prevent climate change.

9. What are some ways we could help protect the agricultural land that we currently use (look at the underlines in your article)?

Answers may include: keeping the soil and water clear of pollution by disposing of chemicals properly, planting trees in areas that might be prone to erosion, eating less meat and dairy, conserving energy to help reduce pollution that becomes acid rain and pollutes the soil, buying food from farmers who practice crop rotation, teaching others about the importance of protecting our soil.

10. Where else does food come from beside agricultural land?

Waterways including oceans, rivers, lakes, and streams. It is important to take care of our waterways as well as our farmland.

MEASURING LEARNING

Students write an exit-ticket that lists one reason it is important to maintain healthy agricultural land and one action that can protect current farmland.

FOLLOW-UP ACTIVITIES

1. Arrange a class field trip to a local farm. At the farm, explore foods that come from the farm, discuss with the farmer how the farm may have changed over the years, and investigate how the farmer keeps the soil healthy.
2. Try the activity, *Scraps into Soil*, in the People and Waste Unit of this curriculum in order to further explore soil and introduce students to the concept of composting. You can use the soil from this activity to start a class or school garden.

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PIE CHART TRACKING SHEET

Name: _____

Date: _____

THE EARTH'S SURFACE

