



Activity: Healthy Soil for Healthy Crops

Activity Summary:

In this activity, students work in teams to examine different types of soil and explore the concepts that each type of soil is appropriate for different kinds of crops based on its composition. Students learn about the importance of protecting soil health for farmers and the actions they take to protect the soil on their farms to have better harvests.

Activity Duration: 30 minutes

Next Generation Science Standards:

MS-ESS3-1: Construct a scientific explanation based on evidence for how the uneven distributions of Earth's mineral, energy, and groundwater resources are the result of past and current geoscience processes.

ESS3.A: Natural Resources: Humans depend on Earth's land, ocean, atmosphere, and biosphere for many different resources. Minerals, fresh water, and biosphere resources are limited, and many are not renewable or replaceable over human lifetimes. These resources are distributed unevenly around the planet as a result of past geologic processes.

Essential Questions:

- How does the type of soil determine the types of food that grows?
- Why is it important that healthy soil is available for growing crops?
- How do farmers protect soil health?

Objectives:

Students will:

- Analyze how the compositions of different types of soil impact how water travels through them
- Explain the importance of healthy soil to food supply
- Identify how farmers protect the soil on their farms

Materials:

- Image of terrace farming
 - Optional resource located at <http://designdrizzle.com/wp-content/uploads/Amazing-And-Beautiful-Terrace-Farming-10.jpg>
- Image of windbreak



- Optional resource located at <https://en.wikipedia.org/wiki/Windbreak#/media/File:FieldWindbreaks.JPG>

One of the following for each student group:

- Four soil samples: One each of sand mixed with soil (labeled “Sandy Soil”), gravel mixed with soil (labeled “Chalky Soil”), silt (labeled “Silty Soil”), and gravel (labeled “Gravel”) each placed in clear plastic containers with equal volume
- Container filled with water
- Measuring cup
- Set of Crop Cards
- Ruler
- Paper or Science Journal

Procedure:

1. Arrange the classroom so that students are working in groups of four. Give each group of students the materials listed above.
2. Instruct students to make a chart with four columns: Sandy soil, Chalky soil, Silty soil, and Gravel. (If necessary, draw a model of the chart on the board.) Then give groups five minutes to examine the four soil types, discuss the composition of each, and record their observations. Students should record at least three details for each soil type.
3. Explain that today they will be examining different types of soil in order to build understanding of the importance of soil to farmers.
4. To begin, tell students that they will have 5-7 minutes to work with their groups to do the following:
 - Observing only one type at a time, slowly pour water onto each type of soil. (*Note: Designate an amount of water based on the amount of soil each group received. The amount of water used must be consistent for each type of soil.*)
 - Observe how quickly the water travels through each type of soil.
 - Record how long it takes the water to soak through the soil and how deep the water reaches.
5. Now distribute one set of Crop Cards to each group. Instruct students to read the three Crop Cards and use their soil observations to determine in which soil type each crop would do best. Students should record their answers (on a sheet of paper or in their

Science Journals). If students believe that a crop would do best in a combination of soil particles, they can record this as well.

6. After groups are finished (after about 5 minutes), allow groups to share their conclusions and discuss any discrepancies in their findings. Students should arrive at the following answers:

- Lettuce: Sandy soil
- Squash: Silty soil
- Corn: Chalky soil

(Note: If students state that some crops would do best in a combination of soil, accept their answers if their reasoning is sound.)

7. Ask students to explain why gravel is not optimal for growing crops, but the other kinds of soil are good for growing some crops. Help students arrive at the following conclusions:

- Crops rely on soil for nutrients, just as people rely on food and beverages for nutrients.
- Growing healthy crops requires healthy, nutrient-rich soil.
- The non-gravel soils contain nutrients that crops need and hold on to water so that different crops can use it as needed.
- In order to maintain the food cycle, it is important to protect soil and keep it as healthy as possible.

8. Ask students if they know of any ways that farmers work to protect the health of their soil. Introduce the term *soil conservation* and explain that it simply means protecting and preserving the soil. Share with students the following:

- Farmers take various steps to conserve their soil.
- Repeated plowing can harm the soil and actually kill beneficial organisms like earthworms and fungi. One way to protect soil is through no-till farming, which means that the soil is not plowed between each crop cycle.
- Other ways that farmers can conserve farmland include (but are not limited to) the following:
 - Terrace farming, in which farmers turn hillsides into a long series of flat steps to protect the soil from erosion
 - Windbreaks, in which a dense row of trees is planted to protect the ground from wind erosion



9. Ask students: “What do you think this investigation has to do with the food you eat?”

Guide the discussion to help students conclude the following:

- Crops need healthy soil and water in order to grow from a seed.
- Animals need healthy crops to eat.
- People need crops and (some people need) animals in order to eat.
- Therefore, people depend on healthy soil for their food supply.
- Farmers make special efforts to protect and preserve the health of their soil so they can produce healthy crops.

Optional Extension:

While soil must maintain a level of health in order for crops to grow, certain crops (such as cover crops) can also positively affect soil. If you think your students would be interested in learning about the positive effects of cover crops, encourage them to visit the following websites:

- http://plants.usda.gov/about_cover_crops.html
- http://www.nrcs.usda.gov/Internet/FSE_DOCUMENTS/stelprdb1082778.pdf
- http://www.ars.usda.gov/SP2UserFiles/Place/30640500/CCC/CCC_v13_5_2012.pdf



Crop Cards

Lettuce

Lettuce grows best in soil that drains extremely quickly and rarely puddles. Lettuce requires a lot of water, but the plant rarely rots or grows mildew because its soil drains quickly and is hardly ever soggy.

Corn

Corn does best in soil that has larger grains and is stonier than other soils. However, it does still need nutrients in its soil in order to grow. The stony nature of the soil allows plant roots to spread out easily. This soil drains fairly quickly.

Squash

Squash grow best in soil that is not too sandy and contains some organic matter. It prefers soil that is rich in nutrients. Its soil should drain relatively quickly, but it needs to be able to hold some moisture. When wet, its soil can be easily molded.