



Lesson title:

Less Drops Per Crop

Overview:

Due to unpredictable weather patterns, drought conditions, and growing demand for crops, farmers have had to adapt their practices with respect to how efficiently they grow crops. In this activity, students will explore sustainable water solutions used by farmers. They also will explore the role that innovative technologies play in improving water efficiency. As an extension, students will design an efficient irrigation system for their home or school garden.

Objectives

Students will be able to:

- Explore technological advancements that have helped farmers improve water efficiency
- Design an efficient irrigation system for their home or school garden

Materials

- Computer connected to the Internet for watching the video
- Copies of the 3-2-1 Video Capture Sheet
- Internet-enabled devices for researching water saving technologies in agriculture
- Chart paper for the water conservation annotated drawing presentations

Have you ever wondered . . .

What is the number one use for water?

How can I help conserve water?

Make connections!

<p>How does this connect to students?</p> <p>Each of us can help make drought conditions and water shortages less severe by practicing water conservation at home, school, and work. Our</p>	<p>How does this connect to careers?</p> <p>Water conservationists work anywhere there is a natural water supply. They help to protect farmland from flooding and ensure</p>	<p>How does this connect to our world?</p> <p>According to estimates by the United Nations Food and Agriculture Organization (FAO), agriculture accounts for</p>
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<p>water resources will become even more strained in the future as the population increases and businesses and industries expand.</p>	<p>that our rivers, streams, and lakes remain free from pollutants.</p> <p>Horticulturists work with plants to maximize their health or growth. They also design sustainable landscapes, inspect fruits and vegetables, and conduct research.</p> <p>Nutrient Management Specialists collect data about the components that go into the growing and processing of crops in an attempt to improve them. They provide advice on crop management plans including crop rotation and tilling practices.</p>	<p>about 69% of global freshwater use. Improved irrigation efficiency and technologies, such as soil moisture sensors, can help farmers apply water more precisely and conserve water on farms.</p>
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Blueprint for Discovery

1. Show the USFRA/Food52 video clip: “A Day on a Produce Farm” [3 minutes, 19 seconds] <http://www.fooddialogues.com/videos/how-to-farming-series/a-day-on-a-produce-farm>
As the students watch the video, they should each complete the 3-2-1 Video Capture Sheet found at the end of the lesson.
2. Call on different students using random response strategies (numbered heads, color-coded cards, equity sticks, calling sticks, online random name generator, etc.) to share one thing they wrote down in their 3-2-1 chart. Key points to emphasize from the video include:
 - A solar facility offsets power usage and provides power to a third of the wells on the farm.
 - All of the old tractors have been replaced by clean burning diesel tractors in order to reduce pollution.
 - A variety of crops are grown on the farm including conventional, GMOs (genetically modified organisms), and organic.

- Many growers use drip irrigation systems or micro-sprinklers to deliver water to their crops so water is metered out and not wasted. This is particularly advantageous during drought conditions.
 - High efficiency sprinkler systems distribute water to crops more uniformly and require less power.
3. Next, split students into four groups, each of which will research their assigned water conservation measure/technology using the links provided.

Group #1: Drip Tape Irrigation

<http://extension.psu.edu/business/ag-alternatives/horticulture/horticultural-production-options/drip-irrigation-for-vegetable-production>

Group #2: Soil Moisture Sensors

http://www.agriculture.com/machinery/precision-agriculture/soilmoisture-senss_234-ar42409

Group #3: Conservation Tillage

<https://www.nal.usda.gov/afsic/conservation-tillage-afsic-find-it-guide>

Group #4: Water Recycling Systems

<https://www3.epa.gov/region9/water/recycling/>

4. Using information uncovered on each innovative measure or technology, students will design a creative, clear, and concise annotated drawing on chart paper to explain how the process helps crops grow while conserving water. An annotated drawing helps communicate a visual representation of thinking and learning. Tell them that they should be prepared to answer accurately any questions related to the facts presented in their poster.
5. Lastly, have each group share their annotated drawing in a 3-minute presentation. Each student in the group will need to have a speaking role. The students can be graded on the level of creativity/attractiveness of their drawing, thoroughness of their explanation of the process/technology, level of detail in their description of water conservation as it relates to that technology, and their ability to answer questions related to the facts presented in the drawing.

Take action!

How can different irrigation systems be used to grow crops during periods of severe drought? You are part of an engineering team that has been challenged to build and test an efficient irrigation system for your home or school garden using everyday items. Think about what materials you will need to build your irrigation system. Also, how will you test and use your irrigation system to conserve water while growing plants in your home or school garden? Collect and use data to justify the design of your garden irrigation system. Your engineering design process should include the following components: defining the problem, brainstorming possible solutions, finalizing a design plan, creating and building your design, and evaluating/improving your design.

National Standards

Science	<p style="text-align: center;"><u>Next Generation Science Standards</u></p> <p>HS-ESS3 Earth and Human Activity</p> <p>Students who demonstrate understanding can:</p> <p>HS-ESS3-2:</p> <p>Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.</p> <p>HS-ESS3-4:</p> <p>Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.</p> <p>HS ETS1-3:</p> <p>Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.</p>
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Name: _____

3-2-1 Video Capture Sheet

3 Things you learned from the video

1. _____

2. _____

3. _____

2 Things you are still wondering about

1. _____

2. _____

1 Thing that surprised you!

1. _____

