



Module 5: Make it Last – Sustainable Agriculture and Agroecology

GOALS AND OBJECTIVES:

Sustainability is a term applied across industries and academic disciplines/ But what does it mean in terms of farming? In this lesson, students will explore what makes a *system* sustainable and apply this definition of sustainability to agriculture. The commonly used framework, *Three Legs of Sustainability: Economy, Environment, and Community*, will be used to evaluate the sustainability of various crops as they move through processes in our modern food system. As an alternative to conventional, industrialized agriculture, students will learn how ecology and agriculture can be paired to create a more sustainable food system through *agroecology*. Four tenets of agroecology will be present: efficiency, self-sufficiency, diversity, and resilience. Students will then use the Healthy Eating Plate to design a nutritious *and* sustainable meal. The lesson ends with a brainstorming session on how students can take action in their own lives to create a more sustainable food system.



TIME: 1 hour 15 minutes

MATERIALS:

- Module 5 Teacher Print Kit
- Module 5 Student Handouts
- Scissors
- Magazines (at least one per two students)
- Whiteboard (or large sheet of paper)
- Pens, colored pencils, markers, or crayons
- Blank paper
- Two colors of string
- 38 magnets or tape
- Garden in any stage of growth



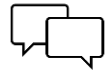
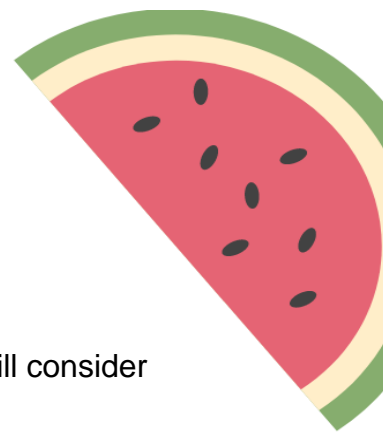
TEACHER BACKGROUND:

Definitions for sustainability and sustainable agriculture vary across sources, but generally sustainable systems have been described as those that can continue over a long period of time, due to the balance and longevity of three main components: the economy, the environment, and the community. Stewardship of the financial, environmental, and social aspects of any system is paramount to sustainability, given that humans are the actors driving, benefiting from, and shaping action. The United Nations Brundtland Commission defined sustainability as, “meeting the needs of the present without compromising the ability of future generations to meet their own needs” (1987). Today, with more than 150 developing countries in the world seeking ways to meet their development needs in the face of climate change and developed nations continuing a trajectory of high per capita consumption, concrete efforts to ensure that current and future development does not negatively affect future generations is essential.¹

Since 1950, we have seen global improvements in life expectancy, lower rates of poverty, and a decrease in child mortality. However, these gains have not been distributed equally, nor have they come without environmental costs. We have exploited the planet at an unprecedented rate, which has contributed to a system of unsustainability and our current climate and ecological crises. Agriculture is both suffering from and driving climate change today.

These three tenets of sustainability—economy, environment, and community—translate to agricultural systems as well. Sustainable agriculture relies on favorable economic outcomes that allow farmers to pay people fairly and provide consumers with access to healthy, affordable food; an environment that can regenerate and is not depleted (e.g., farming that protects the purity of soil, water, and air); and outcomes that benefit and sustain local communities in ways that create connection and partnerships. There are numerous examples of farming practices today that are unsustainable long term, such practices exploit natural resources and workers, rely on energy intensive inputs, and put profits above other concerns. Hence, efforts to better understand how sustainability can be achieved across contexts are needed. (Please see the first four slides of the Teacher Print Kit for more information on sustainability and sustainable agriculture).

Agroecology—the combination of ecology and agriculture to create agricultural systems that work with nature—offers an alternative farming paradigm. Agroecological systems are efficient, self-sufficient, diverse, and resilient.² Respectively, these systems use resources efficiently and have little waste, recycle resources such as water and organic matter on-farm, grow diverse crops (and animals) that support one another's growth, and are more resilient to adverse weather and disease. In addition, agroecological farm operations are often much smaller than industrial operations. This allows farmers to better serve and connect with their local customers, hence strengthening communities. Natural systems provided humans with food before we ever knew how to farm, and now we can learn from nature to farm more sustainably.



OPENING DISCUSSION:

Explore what existing ideas students have about sustainability. Students will consider the concept in more depth and define it in Activity #1.

- *What does it mean to be sustainable?*
- *What is needed to make something sustainable?*
- *What is sustainable agriculture?*
- *What is needed to make agriculture sustainable?*



ACTIVITY #1: THRIVING TOGETHER



TIME: 20 minutes

MATERIALS:

- Teacher Print Kit
 - Includes: Defining Sustainability, Sustainable Agriculture, and Three Stool Legs of Sustainability (pages 1-3)
- Student Handouts
 - Includes: Maslow's Hierarchy of Needs (page 2)
- Post-it notes
- Pens and markers
- White board or a large sheet of paper

LESSON:

1. Ask students to brainstorm the things that humans need to thrive. Write all ideas on post-it notes and post them on the board.
2. Display or pass out copies of Maslow's Hierarchy of Needs (page 2 in Student Handouts). Ask students to use the chart to come up with even more ideas on what humans need to thrive as you go through each level of the pyramid together. Write these additional ideas on post-its and post them on the board.
3. Write "sustainable" on the board and discuss:
 - *Based on our brainstorming session, would we like to add anything to our previous definition of sustainability in our Opening Discussion?*
 - Next, write "sustainable agriculture" on the board. *Would we like to add anything to our discussion about what is needed to make agriculture sustainable?*
4. Share the definitions of "sustainable" and "sustainable agriculture" with students from the Teacher Print Kit.
5. Introduce the Three Stool Legs of Sustainability to students. Write "Economy," "Environment," and "Community" at the top of the board, horizontally.
6. Take down the post-its with brainstormed ideas from the board and pass them back to students. Read them out loud as you pass them out.



7. Ask students to come up to the board and re-post their post-its under the leg of sustainability that they think their note relates most. Ask them to explain why they placed it where they did.
8. End with another discussion:
 - *Give an example of a sustainable project or process in your community. How does it support the community, economy, and environment? (It does not need to be agriculture related!). Is there anything that will make achieving sustainability in this project or process difficult? What systems are in place to ensure that the process will go on for a long time?*
 - Example: A new bike trail was built. It is environmentally sustainable as it reduces carbon emissions from cars. It helps the economy by reducing the need to purchase fossil fuels from companies not reinvesting in the local community. It allows citizens access to nature, recreation, and a shared communal activity at a low cost.
 - The bike trail's sustainability is threatened by the easy use of automobile roads in the city, along with low gas prices. Alternative easy access to transportation may bring about lack of long-term support of the trail's maintenance or expansion.
 - A system in place to ensure the sustainability of the bike trail is a "Helmet Deal" program in the city. When people use their bikes and show their helmets at local stores, they receive a small discount on goods and services.
 - *How are human well-being and sustainable agriculture tied together?*
 - Examples:
 - Humans need love and belonging. Both the economy and the community are bolstered in a sustainable way through farmer's markets and Community Supported Agriculture (CSA) when people make connections with their growers, and wealth is distributed equitably.
 - Humans have physiological needs like clean air and water. Responsible agriculture avoids contaminating water with eroded soil and excess fertilizer.
 - Humans have needs for esteem. When more people own their own local businesses and have creative power over what they offer, there is more pride in the community. Local businesses are very often a bolster to the local economy and serve to build community.



ACTIVITY #2: SUSTAINABLE? YOU DECIDE!



TIME: 25 minutes

MATERIALS:

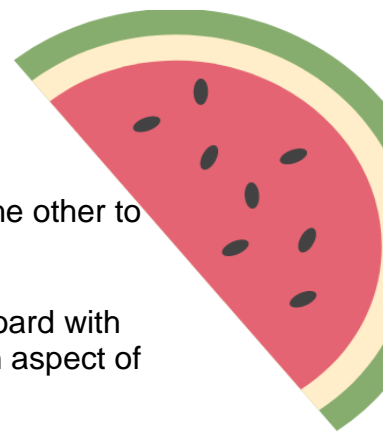
- Teacher Print Kit
 - Food Production Chain Teacher Cards (Cut out; pages 6-9)
 - Three Legs of Sustainability Cards (Cut out; page 10)
- Student Handouts
 - Food Chain infographic (page 3)
 - Sustainable? You Decide! Food Cards (pages 4-13)
- Two different colors of string
- White board or large paper
- 38 magnets or tape

PREP:

Cut Strings into pieces approximately 18" in length. You will need about 20 lengths of each color. One color represents sustainable, the other unsustainable. If you wish to teach the optional section of step 7 in this activity, you will need 15 additional lengths of your sustainable color.

LESSON:

1. Display the *Food Chain Infographic*. Use the Food Production Chain Teacher cards in the Teacher Print Kit to give examples of what these steps of the food chain represent. (Note: These cards are the same as in Module 2: Food Chain). Post the five Food Production Chain Teacher cards horizontally along the top of the board.
 - Production
 - Processing
 - Distribution
 - Consumption
 - Waste Management
2. Post the Three Legs of Sustainability (Economy, Environment, and Community) horizontally along the bottom of the board.
3. Pass out *Sustainable? You Decide!* Food cards and read the notes out loud on the back of the cards as you pass them out. All cards should be passed out evenly among students.



4. Choose one color of string to represent sustainable practices, and the other to represent unsustainable practices.
5. Ask students to post their card, one at a time, along the top of the board with tape or magnets under a step of the food chain and tell the group an aspect of the food's production that fits under that link of the food value chain.
6. Next, ask the students to use a string to link the card to one of the *Three Legs of Sustainability* along the bottom of the board with either a "sustainable" string or an "unsustainable" string. Ask the student to explain one reason why they made the connection that they did.
 - Example: a student may post the tomato card under "Production", then use an "unsustainable" string to point the card to "Community." They might explain that because farm workers on tomato farms are often paid very low wages, the community suffers because workers are not able to make enough money to support good schools, local businesses, and infrastructure in their community.
7. End by noting as a group all the unsustainable strings that were used. For each unsustainable string, discuss a way or ways that the same connection could be made with a sustainable string.
 - Optional: As a visual, you may wish to replace the "unsustainable" strings with "sustainable" strings as you come up with sustainable alternatives to the processes on the cards.



ACTIVITY #3: CONNECTING TO THE GARDEN – NATURE + FARMING = AGROECOLOGY



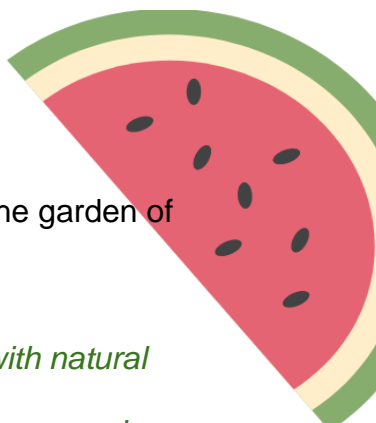
TIME: 10 minutes

MATERIALS:

- Garden in any stage of growth
- Whiteboard (or a large sheet of paper) and markers

LESSON:

1. Agroecology aims to mimic the characteristics and qualities of natural ecosystems to sustainably increase farm productivity. Write the four pillars of agroecology (below) on the board. Go through each pillar with students, giving examples to enhance understanding.
 - **Efficiency:** Agroecology recycles and reuses resources whenever possible, just as natural systems continually recycle rainfall and organic matter.³
 - a. Rain barrels use rainfall rather than irrigation from a well or from the city water system.
 - b. Compost piles turn organic matter from the farm into soil fertilization for next season.
 - **Self-sufficiency:** Agroecology requires minimal inputs beyond what Nature already provides (sunlight, soil, water, and biodiversity).
 - a. Greenhouses increase the ambient temperature for plants without the use of outside heat sources.
 - b. Three sister gardens eliminate the need to buy materials for a trellis, since corn is used as a trellis.
 - c. Some gardeners save seeds rather than buy seeds from suppliers.
 - **Diversity:** Agroecology makes use of many different species of plants and animals on the same farm, and benefits from their interactions.³
 - a. Large squash leaves in a Three Sister Garden of corn, beans, and squash, serve to cover soil as a weed barrier and retain moisture in the soil.
 - **Resilience:** Agroecology can better withstand and recover from shocks like floods, hurricanes, and droughts.³
 - a. Farms that use cover crops (crops planted during the off season to fix nitrogen and provide structure to soil) experience much less erosion of soil during flooding.

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2. Take a short tour of the garden as a group, looking for examples in the garden of agroecology or agroecological principles being applied.
 3. Discuss:
 - *What are ways that we could make our garden more in tune with natural ecosystems?*
 - *How do you think the process from farm to table is different in our garden than produce from the grocery store?*

ACTIVITY #4: SUSTAINABLE MEALS



TIME: 20 minutes

MATERIALS:

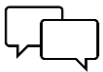
- Student Handouts
 - Includes: Healthy Eating Plate (page 14)
- Blank Paper
- Colored markers, crayons, or colored pencils

LESSON:

1. Optional: To begin, ask students to take the 3 minute “Find Your Foodprint” quiz at <https://foodprint.org/quiz/>.
 - *In addition to what we eat, our foodprint depends on other factors. What are some examples of these?*
 - Examples:
 - Whether our food is grown in season
 - Whether the animals we are eating were treated humanely
 - Growing practices like pesticide use and water use
 - Worker welfare, including safety and wages
 - Food waste management: buying only what we will eat, composting
2. Pass out one blank sheet of paper to each student, along with colored markers, crayons, or pencils.
3. *To conclude our time learning about sustainable agriculture, we will take time to create the most sustainable, delicious, and nutritious plate that we can think of. Start by drawing one of your favorite meals. It doesn't need to be sustainable or healthy to start! When you are done, share your meal drawing with a neighbor.*



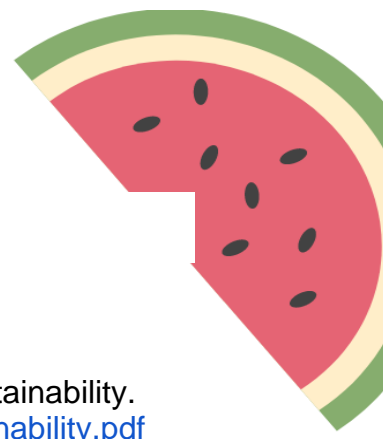
4. Post the Healthy Eating Plate, and briefly go over the categories of a healthy meal according to the Plate. *How might you adapt your favorite meal to align with the Healthy Eating Plate more closely?*
 - Example:
 - If favorite meal is pizza
 - Use whole grain dough
 - Top with vegetables like peppers and tomatoes
 - Replace pepperoni with barbequed chicken
 - Use less cheese
 - Replace soda with iced tea
5. Help your students reflect on the Three Legs of Sustainability: Community, Environment, and Economy. Brainstorm three ways that you could source the ingredients for your meal in a sustainable way. Below are a few questions to start brainstorming:
 - *How can you reduce food miles?*
 - *How can you ensure fair wages for growers?*
 - *What agricultural practices would your farmer ideally use to grow your ingredients?*
6. Ask your students to gather into groups of 3-5. Ask each student to share their plate with the other students in their group. Ask students to share reasons why their meal fits the Healthy Eating Plate. Also, ask students to share their three ways to source their meal in a sustainable way.



CLOSING DISCUSSION:

- *What is one way you could make your community, economy, or environment more sustainable by eating differently? You can refer to Sustainable? You Decide! Cards to spark ideas.*
 - Themes to keep in mind for learning discussion:
 - Worker and animal welfare
 - Limiting meat consumption to cut water and grain usage, along with lowering water and air pollution
 - Growing practices like water use, fertilizer, and pesticide usage
 - Packing
 - Food waste management
 - Seasonal and local food consumption
 - Gardening

For a supportive visual, post “Sustainable? You Decide!” Cards on the board to spark memory and conversation.



REFERENCES:

Teacher Background:

1. UN. "Sustainability." Academic Impact. United Nations, 2022. <https://www.un.org/en/academic-impact/sustainability>.
2. What is Sustainability? From the University of Alberta, Office of Sustainability. <https://www.mcgill.ca/sustainability/files/sustainability/what-is-sustainability.pdf>
Lesson draws from Maslow's Hierarchy of Needs. Graphic available from [thought.co](https://www.thought.co) (2022).

Activity 1:

Adapted from *Toward a Sustainable Agriculture Curriculum for Highschool Students*, [Module 1, Section A: What makes agriculture sustainable?](#) The Center for Integrated Agricultural Systems at the University of Wisconsin-Madison.

Definition of Sustainability from John Ikerd, as quoted by Richard Dueterhaus in "Sustainability's Promise," *Journal of Soil and Water Conservation* (Jan.-Feb. 1990). See also: USDA, 2007. [Sustainable Agriculture Definitions and Terms](#).

Activity 2:

Adapted from Foodprint.org. [Foodprint Website](#). GRACE Communications Foundation, 2022.

Image for Food Chain Infographic from: The Centers for Disease Control and Prevention (CDC), 2022. The [Food Production Chain](#). Food Safety.

Adapted from *Toward a Sustainable Agriculture Curriculum for Highschool Students*, [Module 1, Section A: What makes agriculture sustainable?](#) The Center for Integrated Agricultural Systems at the University of Wisconsin-Madison.

Activity 3:

3. Adapted from Lesson 6: [Turning Toward Sustainability](#) from the *Foodspan* curriculum created by the John Hopkins Center for a Livable Future (2020)

Activity 4:

Image from Student Handouts: Harvard University. "[Healthy Eating Plate](#)." The Nutrition Source. 2011.

Foodprint Quiz from: [Find your Foodprint](#). Foodprint Website. GRACE Communications Foundation, 2022.