



THE FARM IS AN ECOSYSTEM

Educator Lesson Plan

BACKGROUND

An ecosystem is a group of organisms, living and nonliving, and the physical environment in which they interact and transfer energy. The difference between the farm ecosystem and other ecosystems is that humans control most of the interactions on the farm. They work to improve and build soil, reduce erosion, protect water quality, and increase the quality of the habitats for their animals. When parts of the farm ecosystem change or are out of balance, the farm is not able to produce as high a quantity or quality of food. Farmers need to know how the things on their farms interact in order to make choices about how to raise their crops and animals.

The following items are most crucial to the farm ecosystem.

· sunlight · air · water · soil · plants · livestock · decomposers · insects · farmer

Could the farm survive without any of these parts?

Plants cannot survive without sunlight and water. Livestock and insects will also not survive without water, and all three depend on components of the air. Some plants can be produced without soil (hydroponics and aquaponics) as long as they have a source of nutrients, but most require soil to hold their roots. Those roots, in turn, keep the soil in place and prevent erosion. Plants adapted to a particular climate grow best! Different soils contribute to a diverse mix of plants and animals that call the soil their home. Soil is alive! One teaspoon of soil holds more life in it than all of the humans that have ever lived! Since plants are the only organisms that make their own food, animals would not survive without plants. Even secondary consumers (animals that eat animals) could not survive without a previous food source that ate plants. While there are pests that make food production difficult, beneficial insects and pollinators, like bees and butterflies, are necessary for the reproduction of 90% of our world's flowering plants. At least 150 of those plants are food crops. Some people say that animals are not needed in the farm ecosystem, as not all farmers raise livestock, but animal waste is an important nutrient source for plants so including animals on a farm is a big part of regenerative agriculture practices. Grazing animals are also able to digest plants that humans cannot which allows farmers to grow food on land not suitable for fruit and vegetable production. Decomposers break down waste that collects on the earth and turns it into material that is used by plants. The farmer is an important part of the farm ecosystem, as he or she controls what happens to grow food and care for the land. Before humans learned to farm, they hunted and gathered what was around them. When the available food went down, they traveled to a new location. Once humans learned to farm and manage animals, they were able to stay in one place, and communities grew. Today's farmers, of which there are fewer and fewer as time progresses, work to grow food with fewer



resources. They have to watch each part of the ecosystem to make sure the farm has what it needs to survive.

There are many techniques farmers can use to protect agricultural ecosystems, including managing water wisely; building and maintaining healthy soil; minimizing air, water, and climate pollution; and promoting biodiversity. Regenerative agriculture is related to practices and methods that are economically profitable, environmentally sustainable, and good for society. Regenerative farming practices include rotating crops, planting cover crops, reducing or eliminating tillage, applying integrated pest management (IPM), integrating livestock and crops, adopting agroforestry practices, and managing whole systems in a closed loop.

How well farmers care for soil, climate, water, biodiversity and other aspects of ecosystems can greatly influence a community's food supply.

- In certain parts of the world throughout every era, overplowing, deforestation and other forms of soil mismanagement have turned fertile land to arid wasteland. Learn more at [National Geographic](#).
- Farming practices that erode fertile soil persist to this day, even after the Dust Bowl caused massive crop failures, hunger and poverty across the Midwestern United States less than a century ago. Learn more with this [Newsela article](#).
- Agriculture practices that are not regenerative, contribute massively to global pollution. Learn more [here](#).

BUT: Regenerative agriculture is the solution!

KEY VOCABULARY:

ECOSYSTEM: Earth system where living and non-living chemical and physical parts interact.

BIOTIC: the living things in an ecosystem. They may also be called ORGANISMS.

ABIOTIC: the non-living things in an ecosystem, which includes rocks, water, sun, air, and weather. This could also include HABITAT, a place where organisms live, whether natural or man-made.

PRODUCER (AUTOTROPH): An organism that can make its own food.

CONSUMER (HETEROTROPH): An organism that obtains energy by feeding on other organisms.

HERBIVORE: A consumer that typically only eats plants.

CARNIVORE: A consumer that typically only eats animals.

OMNIVORE: A consumer that typically eats both plants and animals.

DECOMPOSER: An organism that will feed on and/or absorb nutrients from dead organisms.

SYMBIOSIS: a relationship where two organisms live together and may or may not benefit.

MUTUALISM - a relationship where both organisms benefit.

PARASITISM - a relationship where one organism benefits (PARASITE) and the other (HOST) is harmed.

COMMENSALISM - a relationship where one organism benefits and the other is unaffected.

Standards Addressed:

- NGSS: LS4-3 Construct an argument with evidence that in a particular habitat some organisms can survive well, some survive less well, and some cannot survive at all.
- NGSS: LS4-4 Make a claim about the merit of a solution to a problem caused when the environment changes and the types of plants and animals that live there may change.
- NGSS:LS2-1 Develop a model to describe the movement of matter among plants, animals, decomposers, and the environment.
- NGSS: MS-LS2-1 Analyze and interpret data to provide evidence for the effects of resource availability on organisms and populations of organisms in an ecosystem

ENGAGE

Building a Web of Connections:

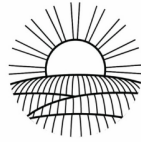
Materials for Activity: Large ball of yarn

This activity makes visible and tangible some of the web of connection that unites and integrates us, the farm and the ecosystems we inhabit.

Have all participants sit in a circle.

SAY: Let's think of this web of yarn not so much as a spider's web, but rather as the parts of the farm that make a whole. All of us are grounded in the particulars of our own lives, but all of us have roots, needs and wants that intertwine with those of others. These interconnected parts give us strength, support and a sense of belonging that empowers us to live and act in the world.

DO: Wrap the end of the yarn around your wrist. Students will then share one fact about themselves. (Example: "I have a dog.") Anyone else for whom that fact is also true will raise their hand (connected to the yarn), and the ball of yarn is tossed around to each of them. Each person who receives the ball of yarn will wrap the yarn around their wrist before tossing the yarn to another person who shares that trait in common. If no other person shares that trait, the person holding the yarn may choose another person in the circle to whom to throw the ball of yarn.



DISCUSS: To Notice - How thick and integrated the web gets. The 'tug' of connection as the yarn is tossed.

DO: Have one student remove the yarn from their wrist. Everyone else in the circle must pull backwards to try to pick up the slack it creates. Repeat a few times if necessary to show how when one part of an ecosystem is removed, it affects all other parts.

DISCUSS: To Notice - This activity, just like the many fragile ecosystems on the earth and even on a farm, depends upon many parts fulfilling their role. Lead the discussion as time allows to discuss how the sun, soil, air, insects, plants and animals each play a critical role in the farm ecosystem.

EXPLORE

CLASSROOM ACTIVITIES

ON-FARM ACTIVITIES

Option 1: Choose one of the activities from [this excellent guidebook](#) that fits the age and interests of your learners.

Option 2: [Schoolyard Ecosystem Scavenger Hunt](#)

[Farm Ecosystem Scavenger Hunt](#) or a variation in which students simply make a list of ecological services or items they find on the farm. Follow up with a group discussion of how interconnected all aspects of the farm are.

EXPLAIN

CLASSROOM ACTIVITIES

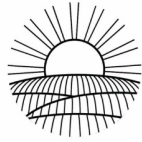
ON-FARM ACTIVITIES

KWL & Video Exploration

1. Have students complete a K-W-L chart about ecosystems at large. They should focus on the "Know" part of the chart for now.
2. Show this [video](#) and have students add notes about what they "Learn" to their chart.
3. Have students think about what they "Want to Know" about farm ecosystems in particular.
4. Show this [video](#) and have students add notes about what they "Learn" to their chart.

Farm Walk-About to discuss the role each feature on the farm plays in the farm ecosystem. Focus on:

- Chicken coops + their manure
- Compost systems + decomposers
- No-Till beds + soil ecosystems
- Berms & Swales garden + stormwater runoff/ deep roots/ native plant benefits
- Purple Martin birdhouse & Bee Hives + ecologically beneficial pollinators
- Intercropping in the orchard
- Tomato hornworm + parasitic



<p>a. Note: SARE has a playlist of numerous ecologically responsible ag practices to explore if learners want to dig deeper.</p> <p>5. Show this video of Ryan Tenney of Sankara Farms in KCMO talking about how farms are ecosystems.</p> <p>6. Group discussion about key points learned and what they want to learn more about (questions remaining). Questions may be sent to info@kcfarmschool.org and will be answered promptly! (Please compile all questions into one document for a prompt reply.)</p>	<p>wasps as an example of parasitic symbiosis that is helpful to farmers</p> <ul style="list-style-type: none"> ● Squash bugs as an example of a parasite that is not helpful to farmers + IPM practices ● Hugelkultur bed ● Greenhouse ecosystem tour ● Rain garden + water conservation ● Three sisters garden + intercropping ● Perennial flower planting + beneficial pollinators and habitat ● Wildland playground + decomposers ● Leaf mulching + water conservation + decomposers ● Biodiversity of field to increase yield and decrease IPM needs
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ELABORATE

CLASSROOM ACTIVITIES	ON-FARM ACTIVITIES
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<p>Option 1: Farming for Ecosystem Services NSTA Activity (MS & HS)</p> <ul style="list-style-type: none"> ● Slideshow ● Link to game & full lesson <p>Option 2: Growing Common Ground: The Challenge</p> <ul style="list-style-type: none"> ● Multi-week project to design a land use plan using ecologically sustainable practices for the 11 acre farm- Common Ground. 	<p>Option 1: On-Farm Ecosystem Improvement</p> <ul style="list-style-type: none"> ● Students will engage in an on-farm, hands-on activity to improve the farm ecosystem and be able to iterate the ecological service it provides. Activities will be based upon the season and farm needs but may include: <ul style="list-style-type: none"> ○ Crop plantings ○ Pollinator house builds ○ Hugelkultur planting ○ Compost bin builds <p>Option 2: Common Ground Tour and planning using the “Growing Common Ground: The Challenge” framework.</p>
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EVALUATE

Have students complete the Education Survey found [here](#) or via QR code



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References:

www.kyagr.com