

Name: _____ Cohort: _____
"City Farm"



Essential Question

Big Idea and Deep Learning Question

OBJECTIVES:

Students will be able to:

1. describe interactions among biotic and abiotic factors in urban cultivated ecosystems
2. explain how ecological interactions lead to emergent properties such as soil health
3. identify specific strategies that improve the sustainability of farming practices
4. articulate the costs and benefits of sustainable urban agriculture for individuals and large groups

NGSS STANDARD: [LS2](#), [HS-ESS3](#)

PROFICIENCY TRACKER:

Activity	(1-4)	Key feedback and next steps
1-Farming + sustainability-ENGAGE		
2: Urban Agriculture-EXPLORE		
3: Rules of the game-EXPLAIN		
4: City Farm-ELABORATE		
5:Reflection and discussion -EVALUATE		

Feedback request

1-Farming + urbanization -ENGAGE

Watch **either** [New York City farming](#) or [Gotham Greens](#). How are these farms solutions to environmental sustainability problems?

1. What did you see?
2. What do you think this means?
3. How does this connect to our previous units?

2: Urban Agriculture-EXPLORE

TASK: Read the following passage and answer the question at the end of this section.

Everyone knows that foods like vegetables, grains, meat, and fruits are grown or raised on farms. Most of us, however, get our food from a grocery store rather than from a garden or farm. If a refrigerator or supermarket is our main experience of food, then it is easy to think that food is always plentiful and instantly available. Urban gardening—in backyard gardens, small-scale community gardens, and larger-scale urban farms—undercuts this common misconception, helping people realize that food takes time, care, and resources to produce.

About 15 percent of the world's food is grown in urban areas. Around the world, and increasingly in the United States, you can find people raising vegetables and livestock in backyards, along roadsides, in vacant lots, and on rooftops and balconies. Urban farming offers the obvious benefit of providing fresh produce, eggs, and meat to people in cities. In fact, urban farms and gardens are one way that communities in some cities cope with a problem known as "food deserts."

A food desert is an area that has few grocery stores, and where the food choices are limited and often inferior (e.g., junk, highly processed, or "fast" foods). Food access can affect health. For example, people living in food deserts suffer cardiovascular disease at nearly twice the rate of people who have access to well-stocked food stores. In Chicago, about 13 percent of its 3 million residents live in areas considered to be food deserts. To supply its residents with fresh food, the city is actively promoting urban gardening and has helped convert vacant lots, parklands, and rooftops to gardens and urban farms.

Local food production offers numerous other benefits, too. For example, locally grown food requires little or no shipping, which greatly reduces its carbon footprint. The Food Climate Research Network has determined that transportation (i.e., fossil fuels burnt by ships, trucks, and planes) accounts for roughly 12 percent of the carbon emissions generated in the overall food-production chain (i.e., growing, packaging, shipping, and marketing).

Urban farms and gardens also transform vacant lots into urban oases. Abandoned lots get cleaned up. Soil is improved. Cool pockets of lush vegetation counterbalance areas dominated by concrete, brick, and asphalt. Plants absorb carbon dioxide from the atmosphere. And the community gains park-like gathering places. This social dimension is significant. Urban gardens often function as outdoor community centers and forums for discussing local issues. Many studies show community gardens to be a galvanizing force, giving a community a new sense of identity and fostering a spirit of goodwill. The neighbor-to-neighbor conversations build connections and can spark action on issues of common concern. At another level, urban gardeners often connect with other urban gardeners, creating a support network. This network can help them strategize solutions to problems, learn about sustainable practices and helpful innovations, and develop joint purchasing and marketing strategies.

Finally, plants are sometimes described as "windows" into the natural world. They can teach us about climate, what living things require, the interactions between organisms, and our own connections to the natural world. For example, being intimately connected to food production helps people understand their place in the food chain. It underscores how our survival is directly tied to natural resources, such as sunlight, soil quality, and water. Gardening also promotes a sense of stewardship, with people protecting local resources, adopting sustainable practices, and finding ways to improve the land.

At first glance, urban gardening seems to be about nutrition and food production. But urban gardening offers a multitude of additional benefits. It also contributes to people's economic, environmental, political, social, spiritual, family, and community lives.

What is the purpose of urban agriculture? (Pro-tip: What problems does it solve?)

3: Rules of the game-EXPLAIN

TASK 1 Before we play *CITY FARM*, we will summarize our understanding of the purpose and processes of the simulation. Read the sections below—"Playing City Farm," "Terminology," and "Strategies" and write a summary for each section. *What is the most important idea in each section?*

Playing City Farm

- Each season, players get \$1,000 to buy crops and upgrades. Crop costs are based upon the cost of seeds and the labor of planting, tending, and harvesting. Budget surpluses are carried over, year to year.
- Players buy four crops. To help players choose, each of the eight crops has an information box summarizing its food yield, water requirements, problems it is prone to, etc. Players strive to choose a mix of crops that will fulfill the goals listed above. To plant crops, players drag each choice onto a plot.
- Players buy "upgrades" (e.g., mulch, drip irrigation, etc.) to maximize yield and help protect crops against problems. To help players choose, each upgrade has an information box summarizing its cost and benefits.
- To get more information about a game element, players click the question mark next to that element.
- In each round of the game, players spin a wheel to see what problem they will have to contend with. Players read a message that summarizes the problem, lists upgrades they may have already bought that protect the garden from this problem, and suggests a remedy they can buy. Players can choose to invest in the proposed solutions only if they have adequate funds in their budgets.
- At the end of each round, a box shows the remaining budget and tallies how each player's garden performed in terms of farm shares, soil health, and water conservation. Players can increase their budget by growing more than 200 shares. These values together contribute to an overall sustainability score.
- After five rounds, the game is over. A final screen totals the farm's food production and sustainability history over the five rounds.
- Players get a sustainability score based on whether they met their production targets each year, the final soil health score, and how much water they conserved. They get bonus points for the money remaining in their budgets. They earn different awards, depending on their scores.

Summary

Terminology

- **Farm shares:** How many bags of produce students harvest and can distribute to the community will depend on which crops and upgrades they choose and how the problems they face affect their crops.
- **Soil health:** Most crops deplete the health of the soil. Certain upgrades and crops can improve soil quality. Healthy soil can protect against some problems players might face.
- **Water saved:** Players have a set amount of water available each year. To be sustainable, they need to minimize water use.

Summary

Strategies

- Pay close attention to information on each crop's card—in particular, how much it costs to plant and tend and how it affects soil health and water use.
- It may be helpful in early rounds to plant only three crops and purchase upgrades.
- Pay close attention to information on each upgrade's card—in particular, how much it boosts food yield, affects soil health and water use, and protects against natural problems. Certain upgrades (such as compost and mulch) deliver a big bang for the buck!
- Planting certain mixes of crops earlier in the game helps maximize sustainability points by providing abundant food shares, which also adds money to the budget. A good mix to try is bush beans, carrots, peppers, and potatoes.
- Avoid planting more expensive crops until you have at least \$200 left over from the previous season. Then, plant just one of these crops. Once the budget surplus grows, you can plant additional beds of these crops.
- Avoid planting crops that are heavy water users or soil depleters until you can purchase upgrades that promote water savings or soil improvements.
- The only sure way to earn a high soil-health or water-savings score is to buy relevant upgrades such as compost, lime, drip irrigation, and water catchments.

Summary

4: City Farm-ELABORATE

TASK: Engage with the City Farm simulation.

Part 1: Background

1. Navigate to this link : <http://www.pbslearningmedia.org/resource/sust13.sci.eco.cityfarm/city-farm/> or google "City Farm Game" and choose the PBS
2. Launch the game: Read the rules carefully!
3. Fill in the chart based on each plant's crop card

Crop name								
Cost								
Surplus value								
Farm shares								
Soil health								
Water needs								

What do you think is the most important factor in choosing which crops to grow?

Part 2: Play the game!

TRIAL 1

Year	4 crops planted	# food shares	Soil health	Water	Total \$	Sustainability points
1						
2						
3						
4						
5						

Award: _____

Total sustainability points: _____

How will you change your strategy to improve your score?

TRIAL 2

Year	4 crops planted	# food shares	Soil health	Water	Total \$	Sustainability points
1						
2						
3						
4						
5						

Award: _____

Total sustainability points: _____

How will you change your strategy to improve your score?

TRIAL 3

Year	4 crops planted	# food shares	Soil health	Water	Total \$	Sustainability points
1						
2						
3						
4						
5						

Award: _____

Total sustainability points: _____

How did your performance change throughout the 3 trials?

Part 3: Guiding Principles

Make THREE PRINCIPLES about how to farm sustainably and explain how you developed each.

1.

2.

3.

5:Reflection and discussion -EVALUATE

1. What are some benefits related to urban gardening?
2. How might gardening make someone more aware of the natural world and of using resources in a sustainable way?
3. If you grow some of your own food, how might that affect how you think about the food you see in grocery stores?
4. Gardens are systems with inputs and outputs. Name as many inputs and outputs as you can.
5. What are some costs and benefits of growing food locally versus shipping food from far away locations? Do these costs and benefits change if we focus on individuals or large groups?
6. How are mathematical models like this useful in learning about science concepts?