



## The Big Picture: Systems

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### Guiding Questions

- What is a system?
- What is an ecosystem and how does it function?
- What is an agro-ecosystem and how does it function?
- What is a food system?
- Where does your food come from?

### Projected Outcomes

After this segment, students will:

- Know ways that agro-ecosystems function to support sustainable agriculture.
- Know the parts of a local food system.

Be able to give examples of practices used in sustainable agriculture, such as organic production, crop rotation, rotational grazing, value-added marketing, and natural habitat restoration.

### Terms

**System:** an interdependent group of items forming a unified whole.

**Ecosystem:** the interactions of energy, the physical environment, and living organisms

**Agro-ecosystem:** an ecosystem that is managed to produce food and fiber

**Food system:** the system that produces, processes, distributes, and consumes food

**Value-added marketing:** a type of marketing that improves the price received by the producer

**Value-added product:** a product that gets a better price because of special attributes

**Habitat restoration:** recreation of desirable (often native) natural habitat



## Background/Lesson

### Introduction

#### What is a system?

A system is defined as “a regularly interacting or interdependent group of items forming a unified whole.” We can look to the human body for an example. A body is made up of interacting and interdependent elements, including organs, muscles, nerves, bones, blood, etc.

#### Agro-ecosystems

What is an ecosystem? IT is a biological community in a physical environment. We tend to think of ecosystems as natural areas like woods or prairies, but farms function as ecosystems too. What are some parts of an ecosystem? Plants, single-celled organisms (fungi, bacteria), animals, people, solar energy, air, water, nutrients, and the physical environment (soil in most agro-ecosystems).

#### How do ecosystems work?

Living organisms in ecosystems get and use energy all the time. There are two laws about energy. Number one: Energy can't be created or destroyed, only converted to a different form. Number two: every time that energy is converted to a different form, some of it is lost, usually as waste heat. How does energy enter ecosystems? Through sunlight captured by plants. What do they do with it? They transform the sunlight energy (through photosynthesis) into sugar, which is the food they need to live. Plants are producers, they produce all their own food. They are the only things that can transform sunlight into food energy.

Elements or nutrients are needed by plants and animals. Every time a plant or animal is eaten, the nutrients in it will be transformed by the eater. Some of the nutrients remain in the body of the eater and some go back to the soil and to the air. Then decomposers in the soil use some of those nutrients, and some go into the soil to be drawn back up and used to grow plants. It's a whole nutrient cycling system. Some nutrients do leave the system in what we call “leaks,” for example in surface water runoff or in ground water leaching. In a sustainable ecosystem, these losses are small, and most of the nutrients can constantly be reused and recycled.

#### What is an agro-ecosystem?

An agricultural ecosystem-or agro-ecosystem- is an ecosystem that is managed to produce food and fiber. Agricultural ecosystems follow the same energy and nutrient rules as natural ecosystems.



Sustainable producers try to do two things:

1. Make the most of the sun's energy
2. Recycle nutrients

Food systems

A food system is the way the food moves from the farm to the consumer. Some of the elements of a food system are:

Production (how the food is grown)

Processing (converting the raw farm product to the state in which it will be eaten.) Processing can happen at a number of places in the food system, from washing of vegetables right on the farm, through many types of processing such as butchering, preparation, and packaging at specialized facilities, to final preparation by the eater, such as cooking, washing, or peeling.

Distribution (how the food is moved from the farm to the eater)

Consumption (how and where the food is eaten-at home, in the car, in the school cafeteria, alone, at a table with family and friends, and so on)

Waste management (what happens to the waste at each stage-does it go to a landfill? A sewage treatment plant? Back to the farm? Does it pollute?)

A local food system is one in which all the stages from production to consumption take place locally.

Local food systems can contribute to sustainability in several ways:

- They keep jobs and dollars in the community
- Producers often get a higher proportion of the retail dollar
- Consumers can communicate directly with producers and request products that are fresher, better tasting, produced without chemical fertilizers and pesticides
- Energy isn't lost on long-distance trucking