### Part 3: Intro to Food Systems & Scavenger Hunt

**NSF Farm Hub Project**

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<table>
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<th>Timing within Module:</th>
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<tr>
<td>This activity is an introduction and should be completed prior to the research project.</td>
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<th>Goal:</th>
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<tr>
<td>To define, identify key differences between, and understand social and environmental impacts of industrial/global and sustainable/local food systems.</td>
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<th>Learning Objectives:</th>
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<tr>
<td>1. To learn differences between sustainable/local and industrial/global food systems</td>
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<td>2. To establish working definitions of agricultural terms and soil management methods.</td>
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<td>3. To understand concepts in a local context.</td>
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<th>Materials:</th>
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<tr>
<td>Section 1: Apple, Knife, Script: The Importance of Caring for the Land <em>(provided)</em></td>
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<tr>
<td>Section 2: Food System Definitions <em>(provided)</em></td>
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<td>Section 3: Magnets <em>(provided)</em></td>
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<tr>
<td>Section 4: 7 Laminated Scavenger Hunt Cards and 7 Riddles <em>(provided)</em>, Tent stakes <em>(provided)</em>, Pens, Clipboards, Scavenger Hunt Worksheet <em>(provided)</em>, CUE Farm map <em>(provided)</em></td>
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<tr>
<td>Section 5: Social Action Reflection <em>(provided)</em></td>
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<th>Preparation:</th>
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<tr>
<td>This lesson contains four sections to be completed in the following order:</td>
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<tr>
<td>1. The Importance of Caring for the Land (10 minutes) – in-class</td>
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<tr>
<td>2. Food System definitions (10 minutes) – in-class</td>
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<tr>
<td>3. Industrial/global versus sustainable/local food systems (15 minutes) – in-class</td>
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<tr>
<td>4. CUE Farm Scavenger Hunt (30 minutes) – in-class</td>
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<tr>
<td>5. Social Action Reflection (15 minutes) – homework or in-class</td>
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Instructors should be familiar with content provided below, particularly the first two sections. Prior to class, instructor should place scavenger hunt cards at the appropriate farm locations.

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<td>A total of 65-80 minutes in-class is needed for this lesson.</td>
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*For a deepening of your knowledge, attend an Institute at The Food Project*

[http://thefoodproject.org/institute](http://thefoodproject.org/institute)
Section 1: The Importance of Caring for the Land

Pretend that this apple is the planet earth—round, beautiful, and full of good things. Notice its skin, hugging and protecting the surface.

(Cut the apple into quarters)
75% of the earth’s surface is covered in water—oceans, lakes, rivers, and streams.
(Toss three quarters away)

What is left represents dry land.

(Cut the quarter in half)
50% of that land is desert, polar or mountainous regions where it is too hot, too cold, or too high to be productive.
(Toss the other half away)

(Cut into four parts)
75% of the remaining land is severely limited by terrain, fertility, and excessive rainfall. It is too rocky, steep, shallow, poor, or wet to support food production.
(Toss three parts away)

(Peel the skin from the final remaining sliver)
The remaining 3%—this small fragment of land area—represents the soil we depend on for the world’s food supply. This fragment competes with other needs—housing, cities, schools, hospitals, shopping centers, landfills, and so on.

We must care and protect this small part of the earth to ensure that it remains productive for the life of future generations.
Section 2: Food System Definitions

**Food System** – A food system encompasses the functions of production, processing, transportation, storage, marketing, preparation, consumption, disposal, and decomposition of food.

**Conventional (global) Food System** – Conventional food systems operate based upon economies of scale. They use a production model that requires maximizing efficiency to lower consumer costs and increase overall production. These food systems tend to operate in the global marketplace and primarily use industrialized agriculture methods of production, although organic agriculture production methods can also be a part of the conventional food system. Conventional systems are largely based on the availability of inexpensive fossil fuels, which is necessary for mechanized agriculture, the manufacture or collection of chemical fertilizers, the processing of food products, and the packaging of the foods for longer shelf life. Because foods are produced cheaply and are often supported by government subsidies, food is considered more accessible.

**Local Food System** – Local food systems provide an alternative to conventional food systems in that they operate with reduced food transportation and more direct marketing, connect the farmer directly to the consumer, provide more transparency in how food is produced, and keep food dollars in local communities. Food is most often produced on a smaller scale than conventional food systems, using organic and/or sustainable agriculture practices, and is sold locally at farmers markets, farm stands, etc. Local food systems are considered a good way to revitalize community, however critics suggest that price premiums for locally produced food can be elitist and inaccessible.
**Industrial Agriculture** – Industrial agriculture is used to produce large quantities of the same product for the global market and is thus tied to the conventional food system. Industrial agriculture techniques include reducing the frequency of fallow years, improving cultivars (often with GMOs), increased use of chemical fertilizers, herbicides, pesticides, antibiotics, and growth hormones, and the mechanization of planting and harvesting. This system is supported by ongoing innovation in agricultural machinery, farming methods, genetic technology, and techniques for achieve economies of scale. This is the primary way food is produced in the U.S. and provides cheap food to the masses however, critics raise concerns of the quality of the food produces, the negative environmental impact of industrial agriculture, mistreatment of farmers and processing plant workers, and lack of transparency in production.

**Organic Agriculture** - Organic agriculture is present in both conventional and local food systems. Organic produce is grown with reduced chemical, antibiotic, or hormone inputs and provides consumers with transparency and information on how food was produced. Organic agriculture has been criticized for being elitist and inaccessible. Critics also suggest that organic agriculture now mimics industrial agriculture while using pesticides and fertilizers that are organically derived.

**Sustainable Agriculture** – Sustainable agriculture integrates three main goals—environmental health, economic profitability, and social and economic equity. The farmer must think about the long-term implications of farm practices and make choices based upon the interactions in the whole farm ecosystem including plants, animals, insects, and soil. Sustainable agriculture uses no chemicals, antibiotics, or hormone inputs. The farm is managed as an ecosystem to improve soil, deter pests, and increase productivity. Sustainable agriculture is usually labor intensive, with the management of multiple plant and animal types. Products are typically sold through local markets, although there has been some scaling of sales to regional levels.
## Section 3: Industrial/Global versus Sustainable/Local Food Systems

1. Using the magnetic cards provided, place the headers “industrial/global” and “sustainable/local” into two columns on the side of the farm classroom.

2. Note to students that there are many configurations of food systems that exist between these two extremes (for instance local conventional or large-scale organic). Also note to students that many of these terms have been green-washed and may no longer adhere to the original definition. Be an informed consumer!

3. Divide the class into up to seven teams and designate a team leader to take notes. These will be used for the next activity.

4. Hand out smaller magnetic cards with terms to teams and have them take turns placing their term under the correct heading while justifying their decision.

5. Use this activity to begin a discussion with your students to clarify the differences between the two food system extremes.
## Section 4: CUE Farm Scavenger Hunt

1. Prior to class start, the instructor should place the laminated scavenger hunt cards at the appropriate farm locations and pin to the ground using tent stakes.

2. Using the same teams (up to seven) used in Section 3, hand out a scavenger hunt worksheet (*provided below*) and one riddle to each group to start the scavenger hunt. This will ensure that each group has a different starting location.

3. Students will find their first location based upon their answer to the riddle.

4. Once students are at the first location, they will answer the questions on the card at that location.

5. Once the questions are answered, they will use the riddle provided on the bottom of the laminated scavenger hunt card to find their next location.

6. Students will know that they have completed the scavenger hunt when their worksheet is complete and they re-encounter their first riddle.
The CUE Farm Manager has suffered a dramatic bout of amnesia and needs your help re-learning some major themes in local, sustainable agriculture! Your quest is to solve riddles that lead you to seven different locations on the farm. At each location, you will find a card with a station number and a series of questions. You must answer these ever-important questions prior to moving on to the next station. Beware of entering answers to the questions under the incorrect station number on this worksheet as this will undoubtedly spoil the quest for knowledge and confuse the Farm Manager!

The answers that lie within this hunt will help you live and lead a more environmentally sustainable world. You have been provided a riddle to get you started on your first location. Best of luck on this honorable quest.

**Station 1:**
1. 
2. 
3. 

**Station 2:**
1. 
2. 
3. 

**Station 3:**
1. 
2. 

**Station 4:**
1.
Station 5:
1.

2.

3.

Station 6:
1.

2.

3.

4.

Station 7:
1.

2.

3.
CUE Farm Map

Unlabeled circles = crop trees and shrubs
Section 5: Social Action Reflection

1. What surprised or concerned you the most about the global/industrial food system and why?

2. What aspects of local sustainable agriculture do you think are most valuable or important in today’s world? Why?

3. What steps will you consider taking to encourage a more environmentally or socially just food system?

4. How will you share your practice with others and enlist them to participate?
Sustainable/Local

Industrial/Global
Cover Crops

Cover crops take up space that can be used for cash crops (vegetables), grasses, and legumes (plants that add nitrogen to the soil) are planted instead of cash crops.

What it does:
- Adds organic matter and nutrients to the soil, to increase soil moisture and lighten soil texture, adds nutrients to the soil, to increase soil moisture and prevent soil erosion.

Limitations:
- Cover crops take up space that can be used for cash crops (vegetables).

Synthetic Fertilizer

Fertilizer made through a synthetic process from fossil fuels.

What it does:
- Provides plants with nutrients in an immediate release form (short-term), which are not the only nutrients that add nitrogen to the soil, are planted that add nitrogen to the soil, are planted.

Limitations:
- Producing it requires lots of fossil fuels.

Compost

Nutrient-rich humus made from decomposed natural waste (manure, grass, food scraps, etc.).

What it does:
- Provides plant nutrients in a readily available, slow release form.

Limitations:
- Producing it requires lots of fossil fuels.

Organic Fertilizer

Fertilizer made from various natural sources.

What it does:
- Provides plants with nutrients in a readily available, slow release form.

Limitations:
- Over-fertilizing can cause nutrient overloads into the watershed.

Conventional Fertilizer

Fertilizer that is not from natural sources, and which are not the only nutrients that add nitrogen to the soil, are planted that add nitrogen to the soil, are planted.

What it does:
- Provides plants with nutrients in an immediate release form (short-term).

Limitations:
- More likely to cause nutrient overloads because it immediately releases nutrients into the soil.
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<td>helps control pest infestations. Helps with soil nutrients by one year. grown on the same piece of land for more than</td>
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<td><strong>What it does:</strong></td>
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<td>Kills beneficial insects eat harmful insects or promote crop growth through pollination.</td>
<td>Helps with soil nutrients by one year.</td>
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<td><strong>Limitations:</strong></td>
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<td>Requires planting of a diversity of plants, which take land from cash crops; must be diverse with many different crops.</td>
<td>Also kills beneficial insects; fossil fuel intensive; contaminates water sources; pest resistance exacerbating future outbreaks.</td>
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| helps with soil nutrients by one year. | kills pests to protect crops, as ladybugs, bees, and spiders eat harmful insects that attract beneficial insects such as native plants that attract beneficial insects such as ladybugs, bees, and spiders.

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**Synthetic Herbicides**

Use of chemicals to control unwanted plants.

**Diversified Crops**

Planting a variety of crops for market and/or integrating crops and livestock in a single site.

**MonoCropping**

Single crops/row crops (soybeans, wheat, corn) grown continuously over many seasons since commodity crops like soybeans, corn require a large acreage, may require more than one crop to maintain biodiversity.

**Natural Weeding**

Rotating crops, using mulch, and hand weeding to reduce weeds, pests, and disease.

**What it does:** Rotating crops, using mulch, and hand weeding to reduce weeds, pests, and disease.

**Limitations:** 
- Labor intensive
- Mulch costly on large acreage
- May require more than one crop to maintain biodiversity

**MonoCropping**

Single crops/row crops (soybeans, wheat, corn) grown continuously over many seasons since commodity crops like soybeans, corn require a large acreage, may require more than one crop to maintain biodiversity.

**What it does:** Mechanized production with low fuel and chemical use; less resilient to pests and weather.

**Limitations:** 
- High start-up capital, high fossil fuel inputs
- Labor intensive
- Larger land area can farmed.
- Separation of crops and livestock

**Diversified Crops**

Planting a variety of crops for market and/or integrating crops and livestock in a single site.

**What it does:** Integrating crops and livestock makes farms more resilient to pest outbreaks and weather.

**Limitations:** 
- Diversifies revenue streams
- Requires more specialized knowledge
- Subsidized by Federal Government; requires more labor intensive; not labor intensive; multiple crops grown commonly over many seasons since commodity crops like soybeans, corn require a large acreage, may require more than one crop to maintain biodiversity.

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- Subsidized by Federal Government; requires more labor intensive; not labor intensive; multiple crops grown commonly over many seasons since commodity crops like soybeans, corn require a large acreage, may require more than one crop to maintain biodiversity.

**MonoCropping**

Single crops/row crops (soybeans, wheat, corn) grown continuously over many seasons since commodity crops like soybeans, corn require a large acreage, may require more than one crop to maintain biodiversity.

**What it does:** Mechanized production with low fuel and chemical use; less resilient to pests.

**Limitations:** 
- High start-up capital, high fossil fuel inputs
- Labor intensive
- Larger land area can farmed.
- Separation of crops and livestock

**Diversified Crops**

Planting a variety of crops for market and/or integrating crops and livestock in a single site.

**What it does:** Integrating crops and livestock makes farms more resilient to pest outbreaks and weather.

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<table>
<thead>
<tr>
<th>Production Approach</th>
<th>Ecosystem Approach</th>
<th>Hand Tended</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliance on technological innovation; large capital investments; large scale farms.</td>
<td>Relies on farmer management, skill and knowledge; more labor intensive; time intensive.</td>
<td>Fewer jobs and lower pay to workers (often migrant workers); high initial wages.</td>
</tr>
<tr>
<td>What it does: Produces large amounts of the same crop using standardized and mechanized methods.</td>
<td>What it does: Produces large amounts of diverse, healthy and nutritious crops.</td>
<td>Produces little to no machinery is used to prepare the land, plant, and harvest in order to increase efficiency.</td>
</tr>
<tr>
<td>Limitations: Requires the use of machinery, synthetics, and fossil fuels; and potentially harmful to soil and ecosystem.</td>
<td>Limitations: Requires low risk and capital investments; large-scale farming is possible.</td>
<td>Limitations: High initial investment, larger corporations; low plant diversity; low resiliency; GMO plants; low plant diversity; low resiliency.</td>
</tr>
</tbody>
</table>

**Mechanized**

- Improved production efficiency; less labor, lower wages.
- Fewer jobs and lower pay to workers (often migrant workers); high initial wages.
- Higher worker wages, smaller land.

**Ecosystem Approach**

- Fosters a diverse and healthy ecosystem that benefits native species and crops.
- Produces large amounts of diverse, healthy and nutritious crops.
- Focuses on innovation and efficiency; large-scale farming.
- Requires the use of machinery, synthetics, and fossil fuels; and potentially harmful to soil and ecosystem.

**Hand Tended**

- Enables the farmer to select only the highest quality produce; enhances soil texture; minimizes fossil fuel use and costs of machinery; easier to see potential problems.
- Produces little to no machinery is used to break up the soil, add nutrients, weed, and harvest.
- Time intensive; more labor required; higher worker wages; higher worker wages.
Competition/Production is as important as supporting the local community.

**What it does:**
- Increased cooperation among farmers; promotion of farm traditions and rural culture; farm work viewed as rewarding as a business; production viewed as a business only with healthy, number of individuals per unit area.
- Livestock requires antibiotics to stay healthy; number of animals in a small area.
- Often mistreated and can hardly move due to the number of animals in a small area of meat products in mass production.
- Allows the automated production of meat products that is typically devoid of plant cover.
- Livestock is confined to a small fenced area.

**Limitations:**
- Larger land area required.
- Herd/Free.
- Limited feed;
- Pets and antibiotics necessary to stay healthy; number of individuals per unit area.

Pasture-Raised, Free Range

**What it does:**
- Animals are free to roam on land freely in a natural environment.
- Pasture-raised and free range animals roam freely in a natural environment.
- Promoted as rewarding as a business; production viewed as a business only.
- Rural culture; farm work viewed as rewarding.
- Farmers' promotion of self-interests; farm work viewed as a business only.

**Limitations:**
- Larger land area required.
Short Supply Chain

Supply chain from producer to consumer

Long Supply Chain

Supply chain from producer to consumer has many intermediaries: processing, transport, packaging, storage, wholesale, retail.

What it does:

- Direct marketing: Specifically and value addressed
- Diversification: locally and regional
- More money to farmer

Limitations:

- More up-front costs; negative area cultivation; limits sales to local/regional
- Greater transport, processing, and storage.
- Requires farmer to find markets; more time spent by farmer selling; small scale
- More labor costs; negative environmental impacts; requires farmer to sell product guarantees sales.

Low Fossil Fuels

Food is produced with lower energy inputs in the form of fossil fuel.

What it does:

- Farmers minimize the use of machinery and synthetic chemicals, hormones, and antibiotics to increase efficiency.
- Global sales require energy and transportation.
- Sales to local or regional customers ensure freshness, processing, lower transport and storage costs.
- Sales to local or regional customers.

Limitations:

- More labor-intensive; small land area cultivated; limits sales to local/regional
- Requires farmer to sell product guarantees sales.
- Requires farmer to find markets; more time spent by farmer selling; small scale
- Greater transport, processing, lower transport costs.
- More money to farmer.
- More labor intensive; negative environmental impacts; relies on large corporations.

High Fossil Fuels

Food is produced with higher energy inputs in the form of fossil fuel.

What it does:

- Farmers use machinery and synthetic chemicals, hormones, and antibiotics to increase efficiency.
- Global sales require energy and transportation.
- Sales to local or regional customers ensure freshness, processing, lower transport and storage costs.
- Sales to local or regional customers.

Limitations:

- More labor intensive; small land area cultivated; limits sales to local/regional
- Requires farmer to sell product guarantees sales.
- Requires farmer to find markets; more time spent by farmer selling; small scale
- Greater transport, processing, lower transport costs.
- More money to farmer.
**GMO**

**What it does:** Creates an organism that is resistant to pests and herbicides.

**Limitations:** Can be cross-contaminated by DNA from other species. Can cross-contaminate non-GMOS. Heavy duty chemicals used for cultivation.

**Grain-Fed**

**What it does:** Livestock eats unnatural diet of cheap, subsidized grains instead of grasses they evolved to eat.

**Limitations:** Livestock eats natural grass instead of grain.

**Non-GMO**

**What it does:** Livestock given medicine to help digest grains; farmers reliant upon large corporations; large areas required for cultivation; can support demand may be greater than what land area can support.

**Limitations:** Livestock given medicine; farmers reliant upon large corporations; large areas required for cultivation; large fossil fuels; milder flavor.

**Grass-Fed**

**What it does:** Livestock eats the food its species evolved to eat instead of cheap, subsidized grains produced via industrial agriculture; evolved to eat instead of cheap, subsidized grains.

**Limitations:** More land areas required; market demand may be greater than what land area can support; farmers reliant upon large corporations; large fossil fuels; milder flavor.

- **Limitations:** Livestock eats natural grass instead of grain.
- **Limitations:** Livestock given medicine to help digest grains; farmers reliant upon large corporations; large areas required for cultivation; large fossil fuels; milder flavor.
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- **Limitations:** Livestock given medicine to help digest grains; farmers reliant upon large corporations; large areas required for cultivation; large fossil fuels; milder flavor.
Scavenger Hunt Riddles
Hand out one riddle to each group to start the scavenger hunt. This will ensure that each group has a different starting location.

I am a wooden home where billions of invisible organisms divide and transform past lives into parts to build new lives upon the year’s renewal.

What likes the colors purple, blue, yellow, and white, is a messy eater, and dies if it gets too angry?

I grow in the forest, but have been brought to the farm in tiny pieces to keep the farm floor healthy.

Like a black watersnake, I am long and slender and I like the water. My plastic skin helps to slither water from bed-to-bed, water dripping through my scales.

I am a house of a certain color, but have no color. I have no lights, but I am filled with light.

I am opposite to the definition of my name because I collect and store items.

As a major architectural element from ancient Rome, I am neither turret nor steeple, I am a _____. _Hint_: rhymes with “Rome”.

Appendix B
Laminated Scavenger Hunt Cards
Place a laminated card at each station and pin to the ground with tent stakes.

Station 1: This is where natural waste products are composted and broken down into rich compost that can then be added to the soil.

1. List five ingredients in the compost pile.

2. What other sustainable method is used to add organic matter and nutrient to the soil, particularly before winter?

3. On an industrial farm, what would a farmer add to the soil to enhance plant growth?

Clue to Next Station: What likes the colors purple, blue, yellow, and white, is a messy eater, and dies if it gets too angry?

Station 2: Yes, the CUE Farm has bees! These honeybees help to pollinate the plants.

1. How many “homes” do you see? What are these structures called?

2. Why do farms need pollinators? Why?

3. How do sustainable farms rid of insect pests? How would insects be controlled on an industrial farm?

Clue to Next Station: I grow in the forest, but have been brought to the farm in tiny pieces to keep the farm floor healthy.
Station 3: Wood mulch can be acquired cheaply because it is a waste product. Other waste products can be used for mulch beyond fallen trees.

1. Name two other types of items that can be used as mulch?

2. Name three benefits of mulching.

Clue to Next Station: Like a black water snake, I am long and slender and like the water. My plastic skin helps to slither water from bed-to-bed, water dripping through my scales.

Station 4: This black plastic tubing is placed at the base of plants and is connected to the nearest waterspout.

1. What is this plastic tubing used for? What is it called?

2. What part of the plant do you think receives the water first?

3. Why do you think this tube system is used instead of sprinklers to water plants on a sustainable farm?

Clue to Next Station: I am a house of a certain color, but have no color. I have no lights, but I am filled with light.
Station 5: This first-ever mobile greenhouse was designed and built by undergrads at Ball State. Pretty cool, huh?

1. How does this structure help plants grow quickly and earlier in the season?
2. Why is the greenhouse clear?
3. What do you think is the ideal daytime temperature inside the greenhouse?
   a. Less than 40 degrees F
   b. 45-55 degrees F
   c. 75 to 85 degrees F
   d. 100+ degrees F

Clue to Next Station: I am opposite to the definition of my name because I collect and store items.

Station 6: Sustainable farms often require very little storage space for tools. Peek inside to see what tools are used on the CUE Farm.

1. Name 3 tools you see in the tool shed.
2. Why do you think a variety of tools are needed for sustainable agriculture? How many different types of plants do you see planted nearby?
3. How do these tools differ from those used in industrial agriculture?
4. Do you think sustainable agriculture tools use more or less fossil fuels? Why?

Clue to Next Station: As a major architectural element from ancient Rome, I am neither turret nor steeple, I am a ______. Hint: rhymes with “Rome”.
Station 7: This is where the CUE Farm brings produce after harvest to prepare it for market with washing and packaging.

1. How do you think the CUE Farm sells its produce? Is it locally sold, nationally sold, or globally sold?

2. If a cucumber is sold for $1, how much of that dollar do you think goes directly back to the CUE Farm? How much do you think goes to other companies for processing, packaging, transportation, and wholesale?

3. Below is an image of how a dollar is distributed in the industrial/global food system. How much goes back to the farmer in this food system type?

Clue to Next Station: I am a wooden home where billions of invisible organisms divide and transform past lives into parts to build new lives upon the year’s renewal.