



**UNIT 2: FOOD AND
THE ENVIRONMENT**

L.13

THE ORIGINS OF AGRICULTURE

Note to Teachers

The big idea for this lesson is that agriculture began as a close dialogue with nature, a relationship over which humans had very limited control. This lesson defines a few key terms—agriculture and domestication—and addresses the origins of agriculture. Rather than approaching agriculture by examining its effects on human societies, this lesson emphasizes agriculture’s relationship with nature. Even as humans began to grow the food they ate, they were not in control of the natural world. Rather, their activities were very much shaped by it.

To open class, consider asking students the following question: How much control do we, as humans, have over nature?

Your students may be deeply engaged with nature, have a very limited relationship with the natural world, or be somewhere between. Assessing roughly what their contact with nature might be can help to set a context for this larger discussion.¹

Your students may have some sense of the problem of climate change and the forces that created it. Yet, if they are urban dwellers, the world around them is heavily mediated by humans. They may never have experienced a moment when writers describe themselves as feeling small in the face of nature: on a mountaintop, looking out at the wild beauty that stretches beneath them, or alone on a windswept beach watching the power of the ocean waves. They may, in other words, see more clearly the power of humans (both positive and negative) than the power of nature.

Use this question to set a baseline of understanding, to which you can return at the end of the unit.

1) How familiar were your students, for example, with the parts of a plant? Do they have a strong camping, hiking or other outdoor tradition? Is their relationship with nature established principally through a household pet? These types of questions offer a wonderful gauge of their experiences.



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Goals *In this lesson, students will*

- understand agriculture as a development that took place over millennia through decisions early farmers may not have understood and without a known end goal.
- identify some of the early practices and products of agriculture.
- appreciate how some geographical areas offered conditions more advantageous to agriculture.

Objectives

- Students will use a Slide Presentation to define key terms and to study key characteristics of early agriculture.
- Students will study maps to look at the advantages that some regions had over others in developing and transmitting crops, animals, and techniques.
- Students will use a final discussion or activity to re-consider the key theme of the day

Materials

- Computer and projector
- The accompanying slide presentation

Instructions

Agriculture – the concept

1. Take a poll among students:
 - a. How many students have lived or worked on a farm?
 - b. How many of your parents or guardians have lived or worked on a farm?
 - c. How many of your grandparents have lived or worked on a farm?
(If the group is true to U.S. statistics, you will get a spike in hands on the last question.)
2. Since only about 1% of the American population is now involved in agriculture, we need to begin by defining it.
 - a. Can students define it? Ask them to try, either in writing or by sharing their ideas.
 - b. A good working definition:
Agriculture: Practices of domesticating plants and animals, and cultivating plants and raising animals.

Inventing agriculture (slide 1)

1. With a good definition at hand, introduce the power point to address some of agriculture's key characteristics.
2. Many of the steps of creating agriculture were unintentional.
 - a. First, farmers can't have known what they were doing because no one knew what agriculture looked like.



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- i. One of the first stages: discovery of the plants that humans enjoyed were growing in their latrines. By eating and defecating the seeds, humans would have accidentally sowed the seeds of foods they liked and found them growing on the site of their latrines.
- ii. Plants were using humans—like birds and other animals—to dispense their seeds.
- iii. Only over the millennia, would humans begin to grow crops intentionally.

Domestication of plants and animals (slides 2-10)

1. Farming depended on the domestication of plants and animals.
 - a. Slide 2 Domestication – growing a plant and consciously or unconsciously changing the plant to make it more useful to consumers.
2. Early farmers would select for traits that they could notice:
 - a. For instance, gatherers and farmers would always choose the best looking, biggest blueberries on the bush.
 - b. Farming contributes to the size of most plants.
 - i. Slide 3 - wild apples are generally one inch in diameter
 - ii. Slide 4 and 5 - the oldest corn cobs were ½ inch long, some modern cobs are 18 inches.
3. Slide 6- Genetic mutation - Sometimes humans select for traits that they would not understand.
 - a. Slide 7 - Example: most wild almond trees produce intensely bitter and poisonous almonds:
Ancient farmers would have eventually noticed the non-bitter ones and planted those unintentionally at first in their latrines, and then intentionally in their orchards.
 - b. Slide 8 - Example: wheat and barley seeds grow at the top of the stalk:
 - i. In order to dispense their seeds, they evolved so the head shatters, dropping the seeds to the ground where they can germinate.
 - ii. But, shattered stalks would have made those seeds exceedingly difficult to harvest. So, humans would have selected for those with a mutation that didn't shatter – altering the direction of evolution.
4. Slide 9 Specific traits - Some wild plants were selected at different moments for different traits:
 - a. Beets, grown in Mesopotamia, were later developed for their leaves (Swiss chard) and then for their sugar content (sugar beets).
 - b. Slide 10 - The same ancient cabbage plants were selected for:
 - i. Leaves – cabbage and kale
 - ii. Stems – kohlrabi
 - iii. Buds – Brussels sprouts
 - iv. Flower shoots – broccoli and cauliflower

Chronology and geographic luck (slides 11-12)

1. Slide 11 the Fertile Crescent - Scholars have discovered multiple centers of domestication, though the “Fertile Crescent” in Mesopotamia is the first.



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2. First domesticates were cereals (wheat and barley) and pulses (lentils and peas).
 - a. Cereal/pulse combination became the basis of diet in most agriculture centers, and grains and beans remain the basis of most diets today.
 - b. Map
3. Slide 12 Fruits and nuts - Thousands of years later (around 4,000 BCE), the first fruit and nut trees are domesticated: olives, figs, dates, and pomegranates.
 - a. These can be grown from cuttings or seeds, but they don't bear fruit right away. Some take ten years to reach full production.
 - b. They needed settled communities first to invest in long-term planting.
4. Some plants are more resistant to domestication.
 - a. Fruit trees like apples, pears, and cherries required much more complex processes, called drafting (ca. 1000 BCE).
 - b. Strawberries were not domesticated until the 13th century by European monks.
 - c. We failed to domesticate many entirely, such as the oak tree (with its nutritious acorns).
5. Slide 13 - Animals have a similar story. Some parts of the world had access to animals that could be domesticated more easily than others:
 - a. Make sure students recognize the concentration of animals in Eurasia – more animals that could be domesticated than anywhere else!

Dialogue with nature (slides 13-16)

1. Early farming had a dialogue with nature in which nature had the upper hand.
 - a. Plants used humans, like other animals to disseminate seeds.
 - b. Humans had to notice what happened in nature and respond to it.
 - c. Humans sometimes changed the course of evolution, but human farming was shaped by the opportunities and limits of nature.
 - i. Slide 14 Example: Plants tend to spread easily along east/west axis, as the climatic conditions are similar, but with great difficulty north/south, as the climatic conditions closer to and further from the equator change dramatically.
 - ii. Therefore, Eurasia had geographic luck. Domesticated plants and animals could spread quickly, creating a broad swath of agricultural societies. Crops spread .7 miles/year as opposed to .3 miles/year for crops moving north/south.
 - iii. Neither of the Andes' domesticated animals (llama and guinea pig) made it to Meso America before the arrival of Columbus, although some crops did (peanut and sweet potato).
 1. Crops must adapt to different climatic conditions to spread.
 2. It is more likely in north/south oriented continents that crops were independently domesticated in more than one place.



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Follow up: Select the option that works best for your students

Early farmers entered into a very close dialogue with nature. At the same time, as Jared Diamond argues in *Guns, Germs and Steel*, the human communities that developed early agriculture had very little control of their environment. Nature had the clear upper hand. Use this last part of the class to emphasize how close humans worked to nature, yet how—because of limited technology and understanding of the natural world—early farmers entered into a very close dialogue with nature.

1. Option A: Open the floor for comments and questions about what students have heard. Move the discussion gradually to the question of how much control humans had over the natural world. How were they able to shape their natural environment? What forces limited their control?
2. Option B: Follow up Activity.

INSTRUCTIONS

- a. Ask students to draw a pie chart. Remind them that a pie chart is a circular graph where “slices” identify a proportion of the whole.
- b. On the basis of what students have heard, they should draw a pie chart that weighs the relative importance of three variables in play at the development of agriculture: human ingenuity, biology (and evolution), and geography.
- c. Give students a few minutes to draw the graph. They should commit to a claim about how much control humans had relative to biological processes and geography.
- d. Ask students to share their graphs with a neighbor and to discuss how they came to their conclusions.
- e. Bring the group back together and ask for three or four students to share their graphs OR to draw them on the board. Look for the degree of difference, or consensus and discuss what you see.
 - i. Diamond doesn't include such a graph, but he is clear that at this early moment of human history, humans had relatively little control over their environment. Human shaping of the environment (through practices like the domestication of plants and animals) is undeniable, but Diamond sees the larger forces of biology and geography as much more powerful. (These dynamics will change later in history, as the following days of discussion will reveal.)

Cooking Lab: Sweet and Smoky Beet Sliders

Beets were domesticated in the Fertile Crescent (Mesopotamia) very early in the history of agriculture. Beets have a common ancestor with other common vegetables, particularly Swiss chard and the sugar beet, the most common source of sugar these days. This makes beets a good example of domestication and the changes it brought—in this case, selection for a large root. The sliders are made from two other ingredients domesticated early in farming's history and even more important in feeding world populations: rice and lentils.



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SWEET AND SMOKY BEET SLIDERS

*Adapted from The New Persian Kitchen
by Louisa Shafia*

12 students

Divide up the class so that a few are prepping the onions, beets, garlic, etc. so that everyone has a job to complete the recipe. Everyone can share a cutting board to shape their own burger.

Equipment List

- 10 cutting boards
- 10 knives
- 5 peelers
- 3 graters
- 1 medium flat walled skillet
- 1 burner
- 1 soft spatula
- 2 wooden spoons
- Food processor
- 1 large bowl
- 2 small compost bowls
- 1 griddle
- 1 flat metal spatula
- 1x 1 Tbsp
- 2x 1 cup dry measure
- 1x ½ cup dry measure
- 1x ¼ cup dry measure
- 1x 1 teaspoon

Food Items

- 1 yellow onion
- 3 Tbsp grape seed oil, plus extra for cooking
- 2 medium beets
- 3 cloves garlic
- ½ cup golden raisins
- 2 tsp smoked paprika
- ½ cup cooked green lentils, rinsed and drained
- Sea salt and freshly ground pepper
- 2 cups cooked short-grain brown rice, at room temperature
- 1 egg
- 12 slider buns
- Condiments of choice such as ketchup, cheese, etc.



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SWEET AND SMOKY BEET SLIDERS

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YIELD: About 12 sliders

Ingredients

- 1 yellow onion
- 3 Tbsp grape seed oil, plus extra for cooking
- 1 cup peeled and grated beets (about 1-2 medium beets)
- 3 cloves garlic, crushed
- ½ cup golden raisins
- 2 tsp smoked paprika
- ½ cup cooked green lentils, rinsed and drained
- Sea salt and freshly ground pepper
- 2 cups cooked short-grain brown rice, at room temperature
- 1 egg
- 12 slider buns
- Condiments of choice such as ketchup, cheese, etc.

Directions

1. Slice the onion in half and cut into ¼ inch pieces. In a medium skillet, sauté the onion in oil over medium-high heat for 10 to 15 minutes, until it starts to darken and caramelize. Turn down the heat slightly and add the beets along with the garlic, raisins and paprika. Cook for 10 minutes, stirring often.
2. Transfer the contents of the skillet to a food processor and pulse several times until chunky. In a large bowl, combine the onion mixture with the lentils, 2 teaspoons salt and 1 teaspoon pepper. Replace the food processor and add the rice and egg. Pulse to form a coarse puree. Add the rice mixture to the onion-lentil mixture and mix well with your hands.
3. Lightly oil your hands and divide the dough into 12 portions. Shape each portion into a patty under 1 inch thick.
4. Heat a griddle over medium-high heat and add oil to coat the bottom. Place the burgers in the skillet and cook undisturbed for 5 minutes. Gently flip the burgers and cook for another 5 to 10 minutes, until the burgers have a firm, brown crust. Serve hot with your favorite condiments.





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Extension

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Note to Teachers

Domestication changes plants and animals so that they become more useful for humans. These changes affect the physical appearance and behavior of both plants and animals. Students understand those changes more deeply if they see them in the context of a single plant. This extension offers a short research assignment that will provide students that opportunity.

Goals *In this lesson, students will*

- understand the changes in plant physiology and behavior engendered by domestication and the usefulness of those changes to farmers and eaters.
- gain more assurance in their abilities to find and evaluate online material.
- understand the process of applying their new knowledge by packaging it in a letter.

Objectives

- Students will use the premise of an upcoming museum exhibit to motivate their research of a specific case of domestication.
- Students will use online research to practice evaluating the credibility of sources and drawing information and ideas from them.
- Students will practice the skill of packaging information to make an effective case to their target audience.
- Students will create visual or other graphic materials to enhance the power of the letters they write.



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Materials

- Computers with Internet access, scratch paper
- Slides

Instructions

I. Review (5 minutes):

Please review the concept of domestication using the accompanying slides. What is it? And why is it important to the development of agriculture?

II. Plant domestication histories:

Please distribute the following student handout. Have computers available for research and writing.

Discuss the premise of the assignment and read through the instructions for students on the attached handout, and keep time for students, adapting where appropriate.

Orchestrate pairs for the peer editing.

III. Sharing

If time remains after the revision process, ask a few students to read their letters aloud, and invite comments and questions on the basis of what you have heard.

PLANT DOMESTICATION HISTORY

In today's class, you will help curators at the "Museum of Agriculture" prepare an exhibit on the earliest domesticated plants. They have asked you, their team of researchers, to help them identify plants that illustrate important characteristics of early agriculture and serve as interesting and important examples of domestication for the museum's patrons. Proposals for inclusion will outnumber the plants that can be included in the final exhibit, so prepare to make a strong case for your particular example.

In order to do so, you will choose and research one plant domesticated early in human discovery of agriculture. It would be ideal to select a plant completely unfamiliar to you so that you can learn about a new food in the process!

1. Select one of the earliest domesticated plants.

FOXTAIL MILLET (*Setaria italic* L. descended from the wild *S. viridis*)

EMMER WHEAT (*Triticum dicoccum*, descended from the wild *T. dicoccoides*)

EINKORN WHEAT (*Triticum monococcum*, descended from the wild *T. boeoticum*)

BARLEY (*Hordeum vulgare/sativum*, descended from the wild *H. spontaneum*)

LENTIL (*Lens culinaris*)

PEA (*Pisum sativum*)

CHICK PEA (*Cicer arietinum*)

BITTER VETCH (*Vicia ervilia*)

FLAX (*Linum usitatissimum*)

FIG TREES (*Ficus carica*)

BOTTLE GOURD (*Lagenaria siceraria*)

POTATO (*Solanum tuberosum*)

BEANS (*Phaseolus vulgaris* L.)

SQUASH (*Cucurbita pepo*)

WATER CHESTNUT (*Eleocharis dulcis*)

PERILLA (*Perilla frutescens*)

RYE (*Secale cereal*)

MANIOC/CASSAVA (*Manihot esculenta*)



PLANT DOMESTICATION HISTORY

2. Conduct research about the plant and its history

(30-45 minutes)

A simple search phrase like the following will often bring up all of the sources you need: “water chestnut domestication”

Make a simple bibliography with the name and URL of each site you use. Be sure to search for credible online sites—sites that credit their sources and are written by people with expertise in the subject matter.

In your research, you want to discover the following:

- The common and scientific names of the plant
- The plant part or parts we eat. Be sure to notice if other parts of the plants can be used in other ways. (To use a parallel example from animals, we eat principally the muscle [meat] and milk from cows, but also have used their labor in the fields and their skins to make clothing, coverings, etc.)
- When and where was the plant first domesticated? Are there any uncertainties about the plant’s origins? Are there any noteworthy moments in the plant’s domestication history or the spread of its cultivation?
- Does the plant offer any nutritional or medicinal advantages?
- How was that early food eaten?
- How important is that plant as a food source today? How commonly is it grown and eaten today?

3. Drafting your case for the museum curators

(30 minutes)

Use this information to craft a letter to the curators at the Museum of Agriculture presenting your case for including your plant into their upcoming exhibition on the history of domestication. Feel free to make graphs, or include maps and images in order to make your case as effectively as possible.

4. Peer Editing (15 minutes)

Trade letter drafts with a classmate. Read the letter carefully and respond to it on the peer review worksheet that is on the back of this handout.

5. Revision (15 minutes)

Expand, improve and edit the draft on the basis of your peer reviewer’s insight.

6. Sharing (15 minutes)



PLANT DOMESTICATION HISTORY

1. What information do you find most useful and interesting in your classmate's letter?

2. What information is missing or needs to be discussed more fully?

3. Are there statements in the letter that you find particularly compelling?

4. Are there any points where the language is awkward or vague?

5. Are the images, graphs or maps useful? Is there other accompanying material that would make a more compelling case for the plant's inclusion in the exhibit?

6. Do you have any other advice to offer?

