

Fleece to Feast

Sheep through time: their cultural heritage and modern innovations

Supported by the Western Sustainable Agriculture Research and Education program under award number SW-22-938

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Sheep Curriculum: <https://tinyurl.com/sheepzone>

Learning Objectives

Students will:

1. Explore the historical uses of sheep and recognize their significance in various cultures.
2. Identify and describe modern innovations related to sheep and their impact on society.

Curriculum is designed for high school juniors and seniors.

Duration: 90 minutes

Preparation and Supplies:

Presentation: Open the “Fleece to Feast” PowerPoint presentation to aid in discussion.

Barter in The Barnyard:

- Print one “game instructions” per group.
- Print and cut-out one set of the “civilization” card deck
- Print and cut-out one set of the “barter” card deck
- Print and cut-out one set of the “stockpile” card deck

Introduction (5 minutes)

- Begin the lesson by engaging students in a discussion about the uses of sheep.
- Ask questions such as,

“What are some products that come from sheep?”

“How long do you think people have been using sheep for these products?”

- Make a list of the products student already know about. Examples may include: leather, fertilizer, dairy products, and wool. *Keep this list, as you will refer back to it later in the lesson.*
- Explain that today’s lesson will focus on how sheep have been used throughout history and important modern innovations related to sheep.

Historic Uses of Sheep (10 minutes)

Earliest Uses

- The **wild Mouflon sheep** was one of the first domesticated animals, dating back 11,000-6000 BC⁵.
- Sheep were used for **meat** as early as 10,000 BC in central and southwest Asia.
- **Wool** use began around 10,000-9,000 BC, but **wool spinning** was not developed until 4,000-3,000 BC.
- Sheep were introduced to Europe around 6,000 BC⁵.
- Cuneiform tablets from Southern Mesopotamia (3,000-2,000 BC) recorded details about sheep flocks, along with details about their color, sex, and age².
- Sheep played an important role in religious and socio-cultural settings and ceremonies, such as sacrifices in Jewish, Romans, and Greek traditions⁶.

How did domesticating sheep contribute to the spread of early civilizations?

- Wool was one of the earliest and most valuable **textile materials**. Because it was lightweight, durable, and insulating, it became a **highly traded commodity** between civilizations.
 - Wool provided warm clothing, allowing people to settle in colder climates where agriculture alone might not have been sustainable⁵. Over time, wool became the primary product for which sheep were bred, supporting economic specialization.
- Sheep provided a reliable meat source, enabling long-term settlements and reducing the need for constant migration³. This stability allowed for population growth and the development of early societies. *What advantages did domesticated sheep provide compared to hunting or relying on wild animals?*
 - **Reliable food source** – Sheep could be raised in **controlled environments**, ensuring a **consistent supply of meat, milk, and hides**. Hunting, on the other hand, was unpredictable.
 - **Sustainability** – Sheep could be bred and raised in large numbers, unlike wild animals, which might migrate or become overhunted.
 - **Multi-purpose animals** – Unlike some other livestock, sheep provided **meat, milk, wool, hides, and even manure for fertilizing crops**, making them more useful for early agricultural societies.
 - **Easier management** – Sheep are **herd animals**, meaning they can be more easily controlled and moved by shepherds, unlike wild game that needed to be chased or trapped.
- Sheep facilitated trade, as wool and meat became valuable goods exchanged between civilizations¹. This trade fostered economic relationships, expanded cultural exchanges, and supported the growth of early markets.

Middle Ages (5th-15th century) and Early Modern History (15th-18th century)

How would geography impact the growth of wool production in Europe?

- The primary uses of sheep (**wool and meat**) grew during the Middle ages, particularly in Europe.
- **Wool** and the **wool trade** became one of England's largest industries, significantly contributing to the European economy—especially after the Black Plague—and helping drive the growth and development of cities⁷. By 1660, **wool textiles** accounted for two-thirds of England's exports in foreign trade¹.
 - **Economic Demand & Labor** – Post-Black Plague, there was a **labor shortage**, which made sheep farming an attractive alternative to labor-intensive crop farming. This helped expand wool production.
- Other major hubs for wool trade and commerce were Flanders (in modern-day Belgium), Scotland, Spain (famous for their Merino wool), and Florence, Italy⁸.
 - **Climate & Pastureland** – Europe's cool, temperate climate with abundant **grasslands** (such as in England, Scotland, and Spain) provided **ideal grazing conditions** for sheep.
 - **Mountainous and Rugged Terrain** – Areas like **Spain and Scotland** were not suitable for large-scale farming but were **perfect for sheep grazing**, leading to strong wool industries.
 - **Trade Routes & Ports** – England, Flanders, and Italy had strong **maritime trade connections**, allowing them to export wool textiles across Europe and beyond.
- The European wool trade eventually declined due to factors such as the Industrial Revolution and the rise of cotton production.

Sheep in the Americas

- In the Americas, Columbus introduced sheep in Cuba and Santo Domingo
- Cortez brought sheep (descendants of these original flocks) into Mexico and the southwestern US
- Pilgrims smuggled sheep across the Atlantic when settling the 13 colonies¹⁵.

Geography and Agriculture (10 minutes)

“Geography determines agriculture...which creates civilization and changes cultures”⁸

- How does geography affect agriculture? What effect does agriculture have on civilization and cultures?

Examples of potential answers: geography’s impact on agriculture:

- Climate and Temperature – Determines which crops and livestock can thrive. For example, sheep are well-suited to temperate and semi-arid regions with grasslands.
- Soil Quality – Fertile soil supports productive agriculture, while poor soil limits crop and livestock options.
- Water Availability – Rivers, rainfall, and irrigation determine the types of farming possible. Sheep can survive in relatively dry conditions, making them ideal for areas with limited water.
- Topography – Flatlands are better for large-scale farming, while mountainous areas may be more suited for livestock like sheep and goats.
- Natural Barriers & Trade Routes – Mountains, deserts, and oceans influence trade and the spread of agricultural practices.

Examples of potential answers: effect of agriculture on civilization and cultures:

- Stable Food Supply – Allowed for permanent settlements, leading to population growth and the rise of civilizations.
- Economic Growth – Agriculture created surpluses, which could be traded, forming the basis for economies.
- Cultural Development – Societies developed traditions, diets, and lifestyles based on local agricultural products (e.g., wheat in Mesopotamia, rice in China, sheep wool in Europe).
- Technological Advancements – Farming innovations (e.g., plows, irrigation) led to further societal advancements.
- Social Structures – Agricultural societies often developed class systems, with landowners and traders gaining wealth and power.

Current Uses/Modern Innovations of Sheep (10 minutes)

Sheep continue to be valuable today, with modern innovations expanding their uses.

- **Innovations related to Products:** *refer back to the list students made at the beginning of the lesson, then compare to the “By-products for sheep” image.*
 - **Hide**—leather, music (drum heads—used in traditional and modern instruments), luggage and upholstery, and sports equipment
 - **Wool**—clothing, felt, socks, yarns, paintbrushes, carpet, mattress pads
 - **Raw Lanolin**—healthcare and cosmetics (lotion, lip balm, cosmetics), adhesive tape, motor oils, shampoo/conditioner.
 - Show videos of lanolin processing in the Edwardian age vs. modern methods to highlight technological advancements.
 - Edwardian era: a video demonstrating the traditional process of lanolin extraction (<https://youtu.be/d2pEIsyWD-Y?si=6ZtGM6jzyNixYvJi>)
 - Lanolin production today: <https://lanolin.com/>
 - Class discussion: *Have you used a sheep by-product today or in the past week?*

- Innovations in **Biotechnology and Medicine**.

Sheep continue to play a significant role in modern biotechnology and medical research, with innovations improving human health, genetics, and pharmaceuticals.

- **Sheep in Nutritional Science:** Researchers have explored enhancing sheep milk with melatonin to provide dietary benefits such as improving sleep quality and antioxidant levels in consumers⁹.
- **Sheep as Medical Models:** Due to their similar cardiovascular and respiratory systems to humans, sheep are used in medical research to develop treatment for:
 - **Cardiovascular disorders** (e.g., heart valve transplants, artificial heart development)
 - **Gene therapy**—a process where scientists modify or replace faulty genes to treat or cure illnesses.
- **Cloning and Genetic Research**
 - **Dolly the Sheep** (1996) was the first mammal cloned from an adult cell, marking a breakthrough in genetics and reproductive science.
 - **Biotechnological Applications: Therapeutic Protein Production**—Scientists have developed methods to produce therapeutic proteins in the milk of sheep, offering a cost-effective way to manufacture complex human proteins for medical treatments¹⁶.
 - **Cloning research** has since led to advancements in:
 - **Regenerative medicine** (stem cell therapy, tissue engineering)
 - **Livestock breeding improvements**
 - **Potential organ transplantation**
- Class discussion: *What ethical questions arise from cloning and gene modification in animals?*
 - Potential answers may include:
 - **Animal Welfare:** Concerns about the health and well-being of cloned or genetically modified animals, including potential malformations and high mortality rates (merckvetmanual.com).
 - **Biodiversity:** The risk of reducing genetic diversity, which could make populations more susceptible to diseases (avma.org).
 - **Moral Considerations:** Debates over the morality of altering animal genomes and the potential long-term impacts on ecosystems (academic.oup.com).

- Innovations in **Agriculture and Environmental Impact**

Sheep play a crucial role in **sustainable agriculture** and **land management**, with modern innovations enhancing their environmental benefits.

- **Targeted Grazing: A Land Management Tool:**
 - **What is it?** –Targeted grazing is the intentional use of sheep (or any livestock) to control vegetation, particularly on rangelands.
 - **How does it work?** –Sheep can suppress invasive plant species through grazing and trampling, making them an effective weed management strategy¹².
 - **Real-World Example:** California and the Great Basin—Sheep grazing is used to reduce cheatgrass, a highly flammable invasive species that increases wildfire frequency.
- **Regenerative Grazing and Soil Health:**

Certain grazing strategies, such as rotational grazing, have been shown to:

 - Restore grassland ecosystems by promoting biodiversity.
 - Improve soil health by enhancing organic matter and preventing erosion.
 - Boost carbon sequestration, helping mitigate climate change.
 - Increase springtime grass production, leading to higher forage availability for livestock and wildlife.
 - **How does this work?**—By moving sheep between pastures, grasses get time to recover, leading to deeper roots and healthier soils.

- **Real-World Example:** Regenerative Ranching in the US Midwest—Ranchers using rotational sheep grazing have seen higher forage yields and reduced dependence on synthetic fertilizers.
- **Natural Fertilizers and Soil Enrichment:**
 - **Sheep manure** is a valuable natural fertilizer, rich in:
 - **Nitrogen, phosphorus, and potassium**—Key nutrients for plant growth.
 - **Microbes and organic matter**—Enhance soil structure and water retention.
 - **Sustainable Alternative:** Unlike synthetic fertilizers, sheep manure improves long-term soil fertility without chemical runoff concerns.
 - **Real-World Application:** Sheep grazing in vineyards—some wineries use sheep to fertilize vineyards naturally while controlling weeds, reducing the need for herbicides.
- Class Discussion: *How can targeted grazing be a more sustainable alternative to herbicides for invasive species control?*
 - Potential answers may include: reduces chemical use, selective, control, prevents herbicide resistance, enhances soil health.
- Class Discussion: *What role do sheep play in mitigating climate change through soil carbon sequestration?*
 - Potential answers may include: promotes deep-rooted grasses, stimulates microbial activity, replaces high-emission practices, improves pasture productivity.
- Class Discussion: *What are some potential challenges of using sheep for land management?*
 - Potential answers may include: overgrazing risk, fencing and infrastructure, predation, limited accessibility, time and labor, public perception and land-use conflicts

Activity: Sheep Across Time—Innovations and Their Impact (20 minutes)

Students will explore how modern sheep-related innovations could have influenced historical societies, fostering critical thinking about technological progress and its effects on economies, agriculture, and daily life.

- **Instructions:**
 - Divide students into small groups (3-4 per group)
 - Assign each group a historical society that relied on sheep (*considering using the civilization cards from the “Barter in the Barnyard” activity*):
 - Anatolia (Asia Minor, modern-day Turkey) - 7,000-3,000 BC
 - Mesopotamia – 6,000-3,000 BC
 - Imperial Roman Empire – 27 BC—476 AD
 - Medieval Flanders – 1,000-1,500 AD
 - 13 Colonies – 1,607-1,776 AD
 - Australia - 1800s - Present
 - Each group must research/discuss how their assigned society used sheep.
 - Then, they will select three modern sheep-related innovations (e.g., targeted grazing, medical research, wool processing) and hypothesize how these innovations could have benefitted their society.
 - **Guiding Questions:** Students should consider the following while making their arguments:
 - *What are the primary ways this society used sheep?*
 - *What challenges did this society face that sheep innovations might have helped solve?*
 - *How would modern innovations have improved life in this time period?*
 - *Would these innovations have changed history? How?*

- **Example Answers:**
 - **Group: Southern Mesopotamia (3,000 BC)**
 - **How sheep were used:** Wool trade, sacrificial animals, food, land management.
 - **Challenges:** Hot climate, limited grazing areas, societal dependence on irrigation.
 - **Modern Innovations That Could Help:**
 - **Targeted Grazing** – Could have helped maintain land and prevent soil degradation in grazing areas.
 - **Genetic Selection for Heat-Resistant Sheep** – Would have helped improve sheep survival in the hot Mesopotamian climate.
 - **Advanced Wool Processing** – Could have increased efficiency in textile production, making Mesopotamian wool even more valuable for trade.
 - **Group: The 13 Colonies (1700s)**
 - **How sheep were used:** Wool for clothing, meat, early trade economy.
 - **Challenges:** Limited wool production, dependence on British textiles, harsh winters.
 - **Modern Innovations That Could Help:**
 - **Fertilization from Sheep Manure** – Could have improved colonial farming, leading to better crop yields.
 - **Industrial Wool Processing** – Would have reduced dependence on British imports and boosted local economies.
 - **Melatonin-Enriched Sheep Milk** – Could have provided colonists with a **nutritious food source** during the harsh winters.
- **Discussion:** Each group presents their findings, and students discuss:
 - *Which modern innovation would have had the biggest impact?*
 - *Would their society have advanced faster if they had access to these innovations?*
 - *Are there any sheep-related innovations today that could still improve agriculture or society in developing regions?*

Activity: Barter in the Barnyard (30-45 minutes)

Buy and trade to develop your civilization!

Conclusion and reflection (5 minutes)

- *How has your appreciation of sheep increased from what you've learned and discussed today?*

References:

1. <https://web.archive.org/web/20130921055328/http://www.danekeclublamb.com/HistoryofSheepandBreeds.html>
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5. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3145132/>
6. <https://academic.oup.com/edited-volume/38591/chapter-abstract/334653021?redirectedFrom=fulltext>
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11. <https://jornada.nmsu.edu/files/bibliography/425.pdf>
12. <https://www.sciencedirect.com/science/article/pii/S1550742419300399>
13. <https://www.sciencedirect.com/science/article/pii/S1470160X21001497>
14. <https://www.metmuseum.org/art/collection/search/322454>
15. <https://www.americanwool.org/wp-content/uploads/2018/12/AWC-History-of-Wool.pdf>
16. <https://animalbiotech.ucdavis.edu/sheep-genome>

Additional resources:

<https://www.wired.com/2014/04/fantastically-wrong-vegetable-lamb-tartary/>

<https://www.youtube.com/watch?v=cdJVqPQXG9I>