Farm Machines: Then & Now

# Target Grade Level / Age Range:

* 3-5th Grade

# Time:

* 45 minutes

# Purpose:

* To learn about history, culture, and innovation in agriculture by comparing old and new farm tools, machines and methods used to plant, harvest, and store corn.

# Materials:

* Farm Machines.pptx
* Photo cards.pptx
* Antique Tools (Optional)
	+ Planter
	+ Hoe
	+ Corn Husking Glove/Hook
	+ Corn Sheller
	+ Corn Knife
	+ Corn Dryer

# Suggested Companion Resources (books and websites)

* Machinery overall:
	+ Corn harvesting and drilling equipment: <http://www.ritchiewiki.com/wiki/index.php/Corn_Harvesting_and_Drilling_Equipment#Corn_Shellers>
* Corn husking glove:
	+ Dakota Life – South Dakota Autumn – Harvest by Hand (excellent video): <https://youtu.be/suy0kGnQXeI>
* Tillage systems:
	+ Tillage and No-Till Systems (article): <http://cropwatch.unl.edu/tillage>
* Combine:
	+ HowStuffWorks Show: Episode 1: Corn Combine (video): <https://youtu.be/u2AvESRQRsg>
* Sheller:
	+ Vintage Corn Sheller (1909) (video): <https://youtu.be/gaEd4JncTDU>

# Vocabulary (with definitions)

* **Agriculture –** Everything involved in growing plants and animals to be used for something else.
* **Planter –** Tool or machine that deposits seed in the ground
* **Combine –** Modern harvesting equipment that combines many jobs during harvesting season
* **Husking (shucking) –** To remove the outer leaves and silks (husks) from an ear of corn
* **Sheller (thresher) –** To remove the seeds or kernels from the rest of the plant material, including the cob, husks, and stalk
* **Grain dryer –** Mechanical drying system that helps farmers maintain a 13% grain moisture for the best storage possible
* **Grain bin –** Large, metallic bin that stores grain after harvest. May have grain drying equipment as well
* **Corn crib –** Large bin, structurally similar to a grain bin, but with wire or wooden walls for additional ventilation. Used to store and dry unhusked ears of corn
* **Corn knife –** Large, broad blade with a short handle, used to chop corn stalks down
* **Furrow –** Small trench intended for planting seeds
* **Cultivator –** Tillage equipment used to break apart lower levels of soil
* **Tillage –** The act of breaking apart soil to (a) prepare the area for planting, or to (b) remove weeds
* **Seed bed –** The area that seeds are planted in
* **Stover –** Leftover “waste” material in a corn field once it has been harvested. This includes stalks, husks, and cobs.
* **Combine head/header –** The front attachment on a combine, meant specifically for a certain type of crop
* **Auger –** A rotating cylindrical tool with a large helical rim used to push grain

# Background – Agricultural Connections (what would a teacher need to know to be able to teach this content)

* Many of our advances as a society have been tied to the mechanical advances of agriculture. By studying the history and technology of these advances, students can gain a better understanding of historical timelines as well as the importance of engineering and innovation.
* This lesson will cover many aspects of raising corn (this crop specifically to ensure cohesiveness). Here’s an outline of each tool:
	+ Antique:
		- Planter
			* This tool has a box that would hold corn seed. The user would hold the handles at the top, place the tip in the furrow, and press the handles together to drop the seed into the ground.
		- Hoe
			* Garden hoes are still commonly used, but only really in small scale. These tools are good for creating furrows, covering seeds, and weeding between rows.
		- Corn husking glove
			* There are many styles of corn husking gloves, but the type pictured has a metal hook in the palm of the hand. This would be used to peel the husks back from the ear of corn, and can also be used to cut the ear from the stalk. In this way, a person using the glove could quickly husk and pick an ear of corn and toss it into a wagon in one motion.
			* There is a good video showing how they are used linked in the Suggested Companion Materials section above.
		- Corn knife:
			* While this isn’t the same thing as a machete, it can look similar. Corn knives are made to cut the tough stalks of corn with a swift chop to the base of the plant. This tool can also be used to cut weeds or similar plants.
		- Corn dryer
			* This tool is essentially just a conglomeration of metal fingers that would pierce the ear of corn and hold them away from each other, allowing the kernels to dry while still on the cob.
			* Corn cribs were also used for larger volumes of corn. They resembled a grain bin, but generally had wire or wooden walls with plenty of air holes. This allowed ears of corn to be stored whole while they dried.
				+ Some discussion points on corn cribs could be:

Effectiveness of deterring pests

Evenness of grain drying

Spoilage or waste

* + - Corn sheller
			* Corn shellers varied greatly over time. Across all styles of shellers, the machine would have some kind of rough surface or teeth that would jostle the kernels from the cob. In the hand crank style shown in the lesson, the crank feeds the ear through the narrowed, spiky opening. The kernels would fall through the funnel into a box, basket, or barrel, and the cob would be rotated to fall the opposite direction, into a separate container.
			* Note: shelling and threshing refer to the same act of removing the kernels from the rest of the plant material.
	+ Modern:
		- Planter
			* Planters today are attached to tractors, and create a furrow, deposit seeds evenly, and cover the furrow in one pass.
				+ Some producers may attach other equipment at once to fertilize or till at the same time as planting. This can save the producer fuel, time, and can protect the soil from unnecessary compaction (which makes it harder for plants to grow).
			* Modern technology such as variable rate technology, row-track, and autosteer, can use maps of the field and GPS to plant the rows straight, evenly, and not overlap when turning corners or on irregularly shaped fields.
				+ Video of row tracking system display in a tractor: <https://youtu.be/J_YpIfgfrjU>
		- Field cultivator
			* Though there are many different types of tillage equipment, field cultivators are widely used.
				+ Other types of tilling equipment might be discs, harrows, chisel plows, moldboard plows, para-plows, subsoilers, rotary hoe, and others. See here for more information on tillage equipment: <http://snapplus.wisc.edu/wp-content/uploads/2013/12/R2TillageGuide.pdf> (field cultivator photo on page 31)
				+ Note: tillage can meet many objectives; to break apart soil in seed bed preparation, to control weeds, or to make the field more level and even (perhaps if the field was grazed by cattle, they can leave ruts, etc.). Depending on the purpose of the tillage, different types of equipment can be used.

Today, many producers are concerned about weed management, soil conservation, and erosion/runoff, making no-till or minimum till operations more prominent.

* + - * Field cultivators (with sweeps) are essentially V-shaped blades attached to a curved, vertical bar. The shape of the blade helps incorporate materials at a lower level without disturbing as much topsoil. By disturbing more soil at the surface, you increase the risk of runoff and erosion.
		- Combine
			* Combines earned their name from *combining* many kinds of jobs in the harvest season. Within the combine, the ears would be picked, husked, and shelled; the stalks would be cut; the grain would be collected; and all other material (cobs, husks, and stalks) would be deposited back onto the field.
			* These machines do not go very fast in terms of miles per hour, but by handling multiple rows at once and by doing all of these jobs at once, the amount of time it takes to harvest a field has fallen dramatically.
		- Mechanical Grain Dryer
			* Now, farmers generally prefer to store their grain in a grain bin and use a mechanical grain drying system as opposed to corn cribs. Grain bins look much like corn cribs, except their walls are solid metal.
			* Though grain drying systems can vary depending on brand, the overall idea is that augers inside the bin will rotate dry grain away from the air source so that wet grain will be subjected to the air flow. Eventually, the grain should be dried equally (to a moisture content of about 13%).
* Though this lesson can touch on many subjects, the engineering, science, and technology as it relates to history should be the main focus. Allow students to learn about history while thinking through the tools necessary to accomplish each task. Agriculture has no shortage of challenges to overcome, and these can be effective teaching tools in challenging students to find solutions.

# Interest Approach or Motivator

* Review what is agriculture, and ask students what experience they have planting or harvesting corn. Ask them what they think it entails. Ask what they think it entailed 40 years ago. 60 years ago. 150 years ago.
* Have them think about the impacts of agricultural innovations. Why does it matter? Who does technological advances help? Where is STEM in Agriculture?

# Procedures

1. **Introduction**
* Begin by asking the group “What is Agriculture? and “Where is STEM in Agriculture” by reviewing slides 1-4 of Innovation in Agriculture PowerPoint.
	+ Talking points for the slides are included in the notes section of the slides.
1. **Card Matching Activity**
	1. Before beginning the activity, take a couple minutes to ask students what they know or what they think they may know about farm equipment.
		1. Allow them to contribute both old and new examples.
		2. Ask the students why you might take the time to learn about these tools.
			1. Talk about technological advances, and how they enable people to work more efficiently. This lets people have time for other things outside of producing food, or have time to produce an increasing amount of food for a growing population. Could also talk about understanding how technological advances tie into history and societal advances.
	2. Have students get into small groups of about 4-5.
	3. Give each group of students a set of the attached photo cards. Tell them to keep the photos face down until you tell them to start.
	4. Explain to the students that they have two sets of photo cards. One set depicts antique farm tools. The other set depicts modern farm equipment. Tell them that it is their job as a group to match the antique tools (denoted by letters) to their modern equivalent (denoted by numbers). Let them know that there are more antique tools than modern tools, so more than two cards can be matched together.
		1. This could be run as a competition. The first group to match all the photos correctly might win (either something tangible or the glory of obtaining knowledge).
	5. Let the students start pairing the photos in their groups.
		1. The correct pairing is:

|  |  |
| --- | --- |
| **A** | **4** |
| **B** | **1** |
| **C, D, E** | **2** |
| **F** | **1** |

* 1. If one group gets the pairing correct before others, have them wait until their peers have completed the activity.
	2. Once the groups have completed, start asking them some questions about what they noticed or what surprised them. Did they know some of these tools already? How did they go about pairing the photos? What things tipped them off? Were there specific structures, or was it more about figuring out what they did before they could find the equivalent?
	3. Encourage your students to actively participate. Have them think critically, analyzing how and why tools work the way they do.
1. **Facilitated Discussion**
* Use the PowerPoint file Innovation in Agriculture.pptx
	1. Before diving into the slides, take a couple minutes to ask students what they know or what they think they may know about farm equipment.
		1. Allow them to contribute both old and new examples.
		2. Ask the students why you might take the time to learn about these tools.
			1. Talk about technological advances, and how they enable people to work more efficiently. This lets people have time for other things outside of producing food, or have time to produce an increasing amount of food for a growing population. Could also talk about understanding how technological advances tie into history and societal advances.
	2. Start in on the slides.
		1. There are 6 antique tools included in the slides, each with three corresponding slides (one asking what it is, one explaining how it was used, and one introducing the modern equivalent).
		2. In the slides, there are photos, videos, and links to more videos and information in the notes section. If possible, take the time to review some of those videos or charts to allow students to see the tools and machines in action, or to demonstrate to them how they operate.
		3. Some slides include discussion questions, such as “why might the blade be broad and flat instead of curved?” or “why is it good to deposit plant material back onto the field?” The notes section will have answers to those questions, as well as some background on questions students may have.
	3. While reviewing the slides, encourage your students to actively participate. Have them think critically, analyzing how and why tools work the way they do.
	4. When looking at the tools, ask what would be good or bad about them. How would they be an improvement over something else? What could be improved about it? Have them think about labor, cost, efficiency, and impact on society and the environment.
	5. If a student asks a question about a piece of equipment you do not know the answer to, you can refer to the links included in this lesson or in the PowerPoint to hopefully help give more background information.
	6. When the slides are completed, hold a small discussion about what they noticed. What will they take forward, how does this impact people (not just farmers, but also consumers), etc. Whose idea do you think it was to create these tools to plant and harvest corn? (Farmers. They needed to solve problems. Creating tools made their jobs easier and more efficient)
	7. Have students take a couple minutes to write down five things they would like to remember, five issues technology helps farmers handle, and five ways they think agricultural technology could improve in the future.
	8. Collect the lists at the end of class or beginning of the next class.

# Essential Files (maps, charts, pictures, or documents)

* Farm Machines.pptx
* Photo cards.pptx

# Did you know? (Ag facts)

* Agricultural equipment is very important in Iowa, with more than 85% of the state’s land area being used for agriculture.
* Agriculture equipment is also built in Iowa! Sprayers and cotton pickers are built in Ankeny, construction equipment is built in eastern Iowa, and implement company, Kinze, has been an Iowa company for decades!
* In 1960, one American farmer fed 25 people. Today, that number is 155.

# Extension Activities (how students can carry this beyond the classroom)

* English Language Arts
	+ Have students read the following quote:
		- “Let us not forget that the cultivation of the earth is the most important labor of man. When tillage begins, other arts will follow. The farmers, therefore, are the founders of civilization.” –Daniel Webster
		- Once they have read the quote, have them write a 1-2 page response.
* Social Studies (history)
	+ Have students pay attention to other areas that have seen technological advances.
	+ Have them record these advances and create a timeline, noting causes and effects of specific historical moments.
* STEM (engineering)
	+ In the wrap up activity, students noted five ways agriculture technology could be improved. Have the students design one of these ideas in a realistic way (cannot label parts of a machine with “magic” or by putting people inside of it, etc.).

# Sources/Credits

* <http://snapplus.wisc.edu/wp-content/uploads/2013/12/R2TillageGuide.pdf>
* <https://www.youtube.com/watch?v=u2AvESRQRsg>
* Vintage Corn Sheller (video): <https://www.youtube.com/watch?v=gaEd4JncTDU>
* <http://www.ritchiewiki.com/wiki/index.php/Corn_Harvesting_and_Drilling_Equipment#Corn_Shellers>
* U.S. Department of Agriculture: <https://www.flickr.com/photos/usdagov/>

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## National Agriculture Literacy Outcomes

* STEM
	+ T4.3-5.a. Compare simple tools to complex modern machines used in agricultural systems to improve efficiency and reduce labor
	+ T4.3-5.b Describe how technology helps farmers/ranchers increase their outputs (crop and livestock yields) with fewer inputs (less water, fertilizer, and land) while using the same amount of space
	+ T4.3-5.d, Provide examples of science being applied in farming for food, clothing, and shelter products
* Culture, Society, Economy and Geography
	+ T5.3-5.c. Explain how agricultural events and inventions affect how Americans live today (e.g., Eli Whitney - cotton gin; Cyrus McCormick - reaper; Virtanen - silo; Pasteur - pasteurization; John Deere - moldboard plow)
	+ T5.3-5.d. Explain the value of agriculture and how it is important in daily life
	+ T5.3-5.f. Understand the agricultural history of an individual’s specific community and/or state

## Iowa Core Standards

* Science
	+ 3-5-ETS1-1. Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
	+ 3-5-ETS1-2. Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
* Social Studies
	+ SS.4.10. Describe how societies have changed in the past and continue to change. (21st century skills)
	+ SS.4.23. Explain probable causes and effects of events and developments.
	+ SS.4.24. Develop a claim about the past and cite evidence to support it.
	+ SS.4.25. Analyze the impact of technological changes in Iowa, across time and place.
	+ SS.4.26. Explain how Iowa’s agriculture has changed over time.