

FROM THE GROUND UP
FAMILY ACTIVITY GUIDE 2:

TAKE A HIGH-TECH VISIT TO A FARM

What do technology and farming have in common? The answer is “just about everything!” From remote control tractors to GPS-created corn mazes, technological advances help to make our farms more productive, more efficient, and more fun! The activities in this guide invite you and your family to learn about modern technology while visiting a farm, and to invent your own new technology to help make a farmer’s life easier. Ready to plug in?

DID YOU KNOW?

In the 18th century, farmers used hoes to cultivate the land and sickles to cut the hay and grain. Both were considered to be very sophisticated forms of technology at the time. Boy, have things changed! Modern-day scientific and technological advancements mean that tractors can apply fertilizer without drivers, cows can be milked by robots, and smartphones can irrigate crops at the push of a button. The world of high tech has reached farms across the country and has changed the way farmers work. These technological advancements could not come at a better time. Increased food demands, extreme changes in weather patterns, limited natural resources, and a troubled economy mean that farmers must look for ways to be more efficient while creating better products. Technology can help to make that happen.

FAMILY CHALLENGE

How much do you and your family already know about farms and technology? Try to guess the answers to these questions. You can play as a team or play against each other. Give yourself one point for every correct answer!

1. Every American farmer produces food for about how many people?
A. 55 B. 155 C. 255 D. 355
2. Fertilizers help _____ food productivity.
A. increase B. decrease
3. What is the primary advantage of no-till farming?
A. Lower machinery costs B. Reduced erosion
C. Decreased water in the soil D. Elimination of weeds
4. What does GPS stand for?
A. Great Produce Stand B. Global Production Systems
C. Global Positioning Systems D. Giant Production System
5. In what U.S. state was the first corn maze built?
A. Texas B. Pennsylvania C. Iowa D. North Dakota

Family Challenge
Answer Key

1. B 2. A 3. B 4. C 5. B

ACTIVITY 1: TECHNOLOGY SCAVENGER HUNT

You and your family have probably visited a farm to pick pumpkins or apples, pet or ride animals, or even to take a hike. But have you ever gone on a scavenger hunt? Now is your chance! Find a local farm that you would like to visit. During your visit, work with (or against) family members to locate the technologies on the list below. Each one is changing agriculture for the better and making life easier for farmers across America. Some of the technologies may be hard to identify. You may need to ask the farmers or those who work on the farm for a little help or to simply tell you if the technology is being used. As you find each technology, consider how it makes a farmer's life easier or more efficient, ultimately assisting in the process of putting food on your dinner table.

Technology	How It Helps Farmers	Found It!
Global Positioning Systems (GPS)	Global Positioning System (GPS) is a satellite-based navigation system that helps vehicles get from one place to another accurately. With GPS technology, tractors can accurately drive themselves through the field! GPS is useful in assessing general crop conditions and for scouting fields from problems, such as nutrient deficiencies. This reduces overlapped fertilizer placement and saves money. GPS also helps farmers know how much land each tractor has covered. Farmers can even take their hands off the steering wheel and drive in a straight line. GPS technology is also used to create corn mazes during the fall season.	
Telematics	Telematics is the integrated use of telecommunications and informatics. It allows equipment to talk to farmers, equipment dealers, and even other equipment. If farmers have a problem with their tractor while they are in the field, their tractor dealer can use telematics to access the onboard diagnostic system of the tractor. Depending on the problem, they might be able to fix the equipment remotely. Telematics also helps farmers keep track of what field equipment is in, fuel consumption, operating hours, and much more.	
Collar sensors	Collar sensors developed for livestock are helping farmers keep track of their animals. Electronic sensors in the collar send information to a farmer's smartphone revealing where an animal might be or if it's in distress.	
Smartphones	Using smartphone technology, farmers can control irrigation systems from a phone or computer instead of driving to each field. Moisture sensors in the ground are able to communicate information about the level of moisture present at certain depths in the soil. This allows for more precise control of water and other inputs like fertilizer that are applied by irrigation pivots.	
Crop sensors	Crop sensors tell application equipment how much fertilizer to apply in real time. Optical sensors are able to see how much fertilizer a plant may need based on the amount of light reflected back to the sensor. Crop sensors can help farmers apply fertilizer in a very effective manner, maximizing uptake and reducing potential leaching and runoff into ground water.	

ACTIVITY 2: A-MAZE-ING TECHNOLOGY

A corn maze is like any maze you would see on paper except the design is set in a cornfield. Instead of solving the maze with a pencil, a corn maze is life-size and you find your way by walking the trails that are cut into the cornfield. Visitors must typically find a series of checkpoints as they navigate the trails through the tall corn. Some corn mazes are simple and easy to get through. Others are more elaborate. In addition to being fun, corn mazes are also a lesson in modern technology.

Developing a corn maze takes long hours of planning, whether designed with traditional graphed-out methods or GPS. For the graphing method, the first step is creating and sketching out a design on a piece of grid paper. Before planting, the maze is measured and marked in the cornfield. The corn is then planted. Once the corn is up several inches to a foot tall, a mower is driven through the field, cutting off the corn according to the design.

GPS (Global Positioning Systems) technology and software can also be used to create a corn maze. It starts by creating a grid plot, either on graph paper or digitally. Then a vehicle is fitted with a GPS tracking device. The vehicle is driven around the farm where the maze will be, and the GPS coordinates are obtained. The electronic version of the maze design is overlaid over the map of the field, where a program plots the maze and lets a mower go through the GPS-guided path for cutting the maze at the right locations.

Corn requires plenty of nitrogen and other essential nutrients to help it grow tall enough to create a maze. Like humans, plants need a proper diet to be healthy. Without enough nitrogen in the soil, the corn plants will be stunted and have yellow leaves. That definitely doesn't sound like the makings of a fun corn maze! Farmers can use satellite images to analyze and detect changes or issues in their crops. Some images show thermal (heat) radiation from the ground below, which helps estimate soil moisture conditions. Other equipment can map samples of the soil every five feet so the appropriate nutrients, like nitrogen, can be applied accurately. Even down to the exact five foot area!

Ready to have some "a-maze-ing" fun at a corn maze? Before visiting the corn maze with your family, see if you can obtain a copy of the map. Maps are often available at the farm's website. Discuss possible challenges. How can the map or an aerial photograph of the corn maze help you in navigating the maze? During your visit, ask for another copy of the map or a set of coordinates to help you navigate. Then, time how long it takes you and your family to get through the maze. You can have lots of fun while working together! Before and after your visit, complete the following chart:

Name of Farm	
Maze Design	
Technology Used to Create It	
Strategies We Will Use	
Predicted Time to Finish Maze	
Actual Time to Finish Maze	
What Could Have Helped Us Go Faster	

Want to create your own human maze using GPS technology? Give this activity a try.

HERE'S WHAT YOU NEED:

- Graph paper
- Pencil
- A GPS unit or device with a GPS application (Note: If a GPS unit is not available, there are several Smartphone apps that provide GPS technology including Google Maps)

HERE'S WHAT TO DO:

1. Measure out your backyard or a plot of land that could serve as the boundary for a human maze.
2. Draw your boundary to scale on a sheet of graph paper. Within the scaled boundary, draw a simple design that is meaningful to your family. Ideas include the first initials of each family member, the name of a pet, or your last name. Imagine that the design would serve as a human maze, similar to a corn maze.
3. Write the directions you would give someone to get from the beginning of the maze to the end.
4. Then, go outside to the plot of land you chose as your boundary.
5. Turn on the track feature or track log of your GPS unit and physically follow the directions you have written, from the beginning of your maze to the end, while holding your GPS. Save the trail you have recorded.
6. Download the data into mapping software to create a map of your maze.
7. Invite friends to follow your map and determine how quickly and accurately they can get from the beginning to the end of your design.

ACTIVITY 3:

INVENT YOUR OWN FARM TECHNOLOGY

Now that you have seen first hand the many types of modern technology used on a farm, it's time for you and your family to invent your own! Imagine you have been asked by a local farmer to create a tool or technology that can help make farming easier or solve a real-world problem. You must work together as a team to create the technology and use an online tool (or a simple pencil and paper) to create a simulation of your invention. Complete the information about your invention below.

Our Invention Name:

Description:

Technology Used:

Problem It Solves/How It Helps Farmers:

Materials Needed:

ADDITIONAL RESOURCES

Nutrients For Life Foundation: www.nutrientsforlife.org

USDA Kid's Page: http://www.usda.gov/wps/portal/usda/usdahome?navid=FOR_KIDS

USDA Farm Service Agency Kid's Page:

<http://www.fsa.usda.gov/FSA/kidsapp?area=home&subject=landing&topic=landing>