High-Tech Farming
The Food and Agriculture Organization (FAO) of the United Nations (UN) projects the world’s population to reach 9.7 billion people by the year 2050.

With 9.7 billion people on the Earth, the world’s farmers will need to grow about 60-70 percent more food than what is now being produced.

As the global population continues to increase, farmers will need to utilize innovative technology to produce more food with fewer resources.
High-Tech Farming (Grades 3-5)

High-Tech Farming (Grades 6-8)

Students will discover technologies that are used on farms to increase efficiency and yields and decrease costs and environmental impact.
What tools were used to milk the cow?

- Stool
- Bucket
What tools were used to milk the cow?

- Robotic milking system
- Digital responders
- Lasers
- Computers
How does technology impact farms?
Agriculture began around 10,000 BC when humans started domesticating plants and animals to ensure a more reliable food source when compared to hunting and gathering. At that time, most work was accomplished by hand with few tools available.

The introduction of powered machinery replaced work previously performed by people and animals (horses, mules, and oxen).

Throughout history, scientific and technological advancements have impacted the agricultural industry by increasing food production and farm efficiency.
Agricultural Technology Timeline
- Self-driving tractors
- Robots
- Drones
- Lasers
3/4 Book

- Write the title (type of technology) on the cover page.
- Draw a picture of the technology on page 1.
- Describe the technology on page 2.
- List the agricultural uses of the technology on page 3.
- Autonomous pickers
- Robotic weed/pest eliminator
- Weed-eliminating lasers
- Agriculture sensors
- Robotic soil-sampler
- Drone-assisted crop monitoring
- Aerial crop imaging
- CubeSat whole farm imaging
- Agriculture data analytics
- Agriculture data-sharing collectives
- High density vertical farming
- Livestock activity monitors
- Livestock breath analysis
- Livestock automated thermal imaging analysis
- Livestock 3-D camera measuring
- Livestock health monitoring
- Automated behavior analysis
- Inland saltwater fish farms
- Bacteria-based fish food
- Insect flour and protein powder
- Cultured meats
- CRISPR
Agricultural Engineers

- What do agricultural engineers do?
- What types of problems are they trying to solve?
Farming Challenges

Horn Flies
Horn Flies make a solution with 3 cups of sugar, 2 cups of water, and half of a lemon. Put it on your plants and it will help them grow more. The flies will be treated and won’t eat them anymore. This will help the amount of horn flies in any field or any garden.

Drought
We would build a levee holding the river, nearby to the crops. We would use bags of sand and then put the levee. We would use two large gates to help water the field from the river, therefore filling up the tank. The rainwater would be pumped closer to the entrance, so as to stem the flow if not needed or burned the crops. A little door would stop the flow unless opened, the door would slide back and fourth so you could open & close it more easy. If it was to be fixed in and cut it would be harder to stop, because of the water would push it against it.

Lettuce
Harvesting lettuce all day gets hard because you have to water it everyday. Instead of people watering it we could make a robot. The robot would have claws that can extend to cut the lettuce. After it cuts, grab the lettuce, put it into a metal bin. The robot would also be able to use if the lettuce is ripe.

Wild Hog
This robot will not eat or do any damage. They must not destroy anything. The robot can warn the farmers if something is wrong.

Diagram:
- A robot that can grab the lettuce and put it into a metal bin.
Robots in High-Tech Farming (Grades 3-5)

Robots in High-Tech Farming (Grades 6-8)

Students will discover the four main components of robots, explore how robots are used in agriculture, and program and operate a robot to address a farming challenge.
<table>
<thead>
<tr>
<th>Robot</th>
<th>How it helped the farmer</th>
</tr>
</thead>
<tbody>
<tr>
<td>rooster-bot</td>
<td>helped the farmer so he wouldn't sleep in too late</td>
</tr>
<tr>
<td>chick-bots</td>
<td>helped with heavy lifting</td>
</tr>
<tr>
<td>cow-bot</td>
<td>helped with lube and fuel</td>
</tr>
<tr>
<td>sheep-bot</td>
<td>helped the farmer buff the metal</td>
</tr>
<tr>
<td>horse-bot</td>
<td>helped haul in the lunch</td>
</tr>
<tr>
<td>flying pig-bot</td>
<td>helped the farmer zip around the farm</td>
</tr>
</tbody>
</table>
During the process of engineering design, it is unusual to have immediate success. As Wallace’s robot illustrates, failure is part of the process. Typically, engineers test, modify, and redesign prototypes multiple times before they finalize a product.
What is a robot?
- Robot: a mechanical device that is capable of performing a variety of tasks on command or according to instructions programmed in advance.
- A robot has four main components—a computer, inputs, outputs, and a power source.

Why do engineers design robots?
- Robots can do jobs that are repetitive, boring, messy, difficult, or hazardous for humans.
- Unlike humans, robots can work virtually nonstop without becoming strained or injured by repeated movements.
- Robots can be built to be much stronger than people.
- Robots deliver consistent results.
- Robots can perform tasks faster, longer, more accurately, and more efficiently than humans.
How are robots used on farms?

- Robotic Milker
- Automated Robot Weeder
- Poultry Robot
- Autonomous Combine Harvester
- Robotic Lettuce Harvester
Farm Robotics Challenge
Students will discover the science behind how a drone works, explore how drones are used in agriculture, and program and operate a drone for the purpose of surveying a field or monitoring grazing sheep.
How do drones fly?

- Gravity is the natural force that causes things to fall toward the Earth.
- Lift is the force that directly opposes the weight of the aircraft and holds the aircraft in the air.
- Quadcopter drones use rotors to help the drone lift off the ground and fly.
- As the rotor pushes down on the air, a force that equals or exceeds the force of gravity must be created. This is called lift.
- The faster the rotors spin, the greater the lift.
Drone Mission