



Emerging Technologies in Agriculture

Middle School Food and Agricultural Literacy Curriculum

Precepts

- A. Action
- A2. Focus on Results

National Standards

CS.10.01.01.b. Discuss the use of mechatronics (such as lasers and robotics) and their impact on AFNR systems.

PST.05.02.04.a. Identify the importance and uses of computer-based systems in agriculture, food and natural resources.

PST.05.03.01.a. Identify geospatial technologies, including global positioning, geographical information and remote sensing.

PST.05.03.03.a. Identify uses, components and setup of precision technology in agriculture, food and natural resources.

NL-ENG.K-12.12 – Applying Language Skills

NS.5-8.2– Physical Science

NS.5-8.4 – Earth and Space Science

NS.5-8.5 – Science and Technology

NSS-G.K-12.1 – The World in Spatial Terms

NT.K-12.2 – Social, Ethical, and Human Issues

Student Learning Objectives

As a result of this **unit** the students will...

Recognize the significance of emerging technology in agriculture.

As a result of this **lesson** the students will...

Cite five examples and applications of emerging agricultural technologies.

Content Outline

- I. **Cite five examples and applications of emerging agricultural technologies.**
 - A. Global Positioning Systems
 - B. Robotics in agriculture
 - C. NASA and agriculture

Time

Instruction time for this lesson: 45 minutes.

Resources

National FFA Organization. (2009). LifeKnowledge Online. Retrieved July 9, 2009, from <http://agedlearning.org>
National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success. — YouTube, LLC. (2009). YouTube. com. Retrieved December 29, 2009, from <http://www.youtube.com>

Tools, Equipment, and Supplies

MS.AST.4.1.AS.F-J – one set for the station, see Objective 1
MS.AST.4.1.AS.A-E – one each per student
MS.AST.4.1.AS.ESS.A – one per student
Marker
Five laptop computers (or one per station, see Objective 1)

Key Terms

The following terms are presented in this lesson and appear in **bold italics**:

GPS

Robotics

RFID

Phone-controlled sprinklers

- D. Radio Frequency Identification and agriculture
- E. Phone-controlled sprinklers

Interest Approach

A cell phone would be useful to have during this interest approach. Lead students to expand their thinking on the common technology of cell phones to more advanced uses of cell phones in their lives.

It's good to see everybody today! How many of us could not live without our cell phones? I know that I rely on it every day to stay connected with friends and family. Cell phones are not just for talking anymore. Think of everything that cell phones do!

At your table make a list on a piece of notebook paper of all the different uses that we can do with our cell phones. We have two minutes!



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Give students two minutes to make their lists. Expected results: play games, texting, listening to music, light, taking photos, GPS. Give them hints if they need help. After time is up, elicit responses.

Let's hear about all the things that cell phones can do! Who will share first?

Explain to students that technology is changing so fast that there will be many other things cell phones will be used for in our lives and in agriculture.

We heard a lot of cool things that we do with our cell phones! The fact of the matter is that all these things are just the tip of the iceberg. Technology is moving at a rapid pace and that includes cell phone technology. Listen to this agricultural example. Did you know that we can control sprinkler systems using our cell phone? It will even text us if there is a problem with our sprinkler system.

Today we explore emerging technology in agriculture. Stay tuned as we dive right into this exciting topic!

Summary of Content and Teaching Strategies

Objective 1. Cite five examples and applications of emerging agricultural technologies.

Before class starts have the five stations set up around the room. The five stations correspond with **MS.AST.4.1.TM.F-J**. Therefore, each station should have one of the activity sheets and one computer set up for the video. At each station students will answer questions on their worksheets (**MS.AST.4.1.TM.A-E**) and watch a short video about that station. If access to five computers would be difficult or impossible, have them visit the stations and gather the information at their own pace. Then pick a couple of the videos to show in a whole-class setting. The five stations will be about the following topics:

Use **MS.AST.4.1.AS.A**

Emerging Agriculture Technology Stations:

A. GPS

1. Uses satellites in space to pinpoint a tractor's exact location in a field. Global Positioning Satellites (GPS) allow a farmer to actually produce maps of their fields. These maps tell a farmer important information such as soil type, moisture, yield of crop, and even weed and insect problems. This information allows the farmer the precision to apply just the right amount of tillage, fertilizer, herbicide, seeds, or even irrigation water. GPS greatly reduces waste of materials and the field gets exactly what it needs. In the end it will reduce expenses and help the farmer get a better crop yield. In the future, GPS will be used to harvest a field without a driver or a remote operator.
2. Watch the YouTube video Precision Farming.
3. Video can be found at this link: http://www.youtube.com/watch?v=zfU_w03VeM8

B. Robotics in agriculture (use **MS.AST.4.1.AS.B**)

1. Robotics is a very exciting field in agriculture. Robots are being used more and more in agriculture. Robotics are used to milk cows, shear sheep, harvest fruit, and weld metals together. These robots help decrease the amount of labor producers have to do. Robots are also very useful in completing tasks that are more dangerous to humans.
2. Watch the YouTube video Lely Astronaut A3 Milking robot
3. Video can be found at this link: <http://www.youtube.com/watch?v=1Vo4NJU5wTk&NR=1>

C. NASA and agriculture (use **MS.AST.4.1.AS.C**)

1. NASA satellites provide large amounts of data about how we grow food on planet earth. They let us know how "green" regions of the world are. This allows us to see how many crops are growing and if that crop is doing well. This information is useful because then we can predict which nations will have food shortages. Food prices, food trade and aid decisions can be made because of NASA's data.
2. Watch the YouTube video NASA Science for a Hungry World: Part 2
3. Video can be found at this link: <http://www.youtube.com/watch?v=3rucWGuj0Lk&feature=channel>



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Emerging Agriculture Technology Stations...continued

D. RFID (use **MS.AST.4.1.AS.D**)

1. Radio Frequency Identification (RFID) is becoming more and more commonplace. It can be inserted or applied on an animal, object, product, or even a person to help identify and track them. One example in agriculture is its use in dairy cattle operations. When a cow enters to get milked, her tag is read and she is given a predetermined amount of food. The producers can track how much milk she gives a day, how many times she is milked, and how much she eats. There are numerous other examples used outside of the agriculture industry, ranging from tracking inventory in stores to having RFID in our vehicles to bypass tollbooths.
2. Watch the YouTube video Mind Blowing Cow Technology: Bella Health Systems at WAE.
3. Video can be found at this link: <http://www.youtube.com/watch?v=AMSpZ8XxthY&feature=related>

E. Phone controlled sprinklers (use **MS.AST.4.1.AS.E**).

1. For individuals that own or manage many different properties such as a school district or a city making sure all their lawns are properly irrigated can be a very big task. Also, people are always looking for ways to save a few extra dollars. There are irrigation systems that can control hundreds of sites and monitor weather conditions from one central location. This could be through your telephone, cellular modem, radio frequencies, and cable connections. Many of these designs also send alerts to this central location when there are problems with the irrigation system.
2. Watch the YouTube video Mobile application to remote control irrigation pump.
3. Video can be found at this link: <http://www.youtube.com/watch?v=2c47UhGdo5I>

We are gearing up to learn about five different emerging technologies in agriculture! To do this we will be moving around the room to five different stations. At each station we will learn about a specific technology and how it affects agriculture. There are a few questions on our worksheets

to answer. After we finish our questions for that station, watch a short video clip showcasing that technology in agriculture.

Split the students into five groups with approximately four students per group. For a larger class, set up more stations so that there are doubles of each station.

Students will be performing a Go-Get-It e-Moment® as they walk around the room from station to station. Give them their final set of directions and have them explore the emerging technology in agriculture.

When you hear the word EXPLORE, travel with your group to the station that you have been assigned. We will do three tasks at each station. First, read. We what? Elect one person to read the technology description. Second, we watch. We what? Watch the video that is already set up on the computer. Last, we triangle! We what? Fill out our technology triangles with three facts, two advantages, and one question that we have relating to that technology. What were the three tasks again? Remember, read, watch and triangle! Now EXPLORE!

Give students five to seven minutes at each station and then tell them to rotate stations. Give them frequent time updates to keep them on task. At the end of their last station bring them back to their seats to review.

At this point, we should be writing and finishing up our last technology triangle. We have one minute remaining.

After one minute get students back to their seats.

Let's think about one interesting fact we learned while we find our way back to our seats.

Bring this activity to an end and transition into the review by asking them questions about what they learned.

We have seen five technologies that are being used more and more in agriculture. Who will share one interesting fact they learned about today? Who will share an advantage that they learned about today? Finally, who will share with us a question they have about one of the technologies we learned about?

These technologies are all about focusing on results and making our world run more smoothly. They make it so we spend less money and maybe even more importantly less time. Let's see if we can



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apply this same concept to our lives.

Facilitate a discussion about using technology in our lives using the following questions:

What is something we could do that would make us more efficient students?

What is something we could do that would make us more efficient in FFA or a sport we play?

Now back to biotechnology! Biotechnology is all around us. Let's review some key information that we learned today.

Review/Summary

Students will use the Picasso e-Moment to review the information about the technologies by creating a picture or illustration for one of emerging agricultural technologies they learned about today.

Based on our discussion it sounds like we learned a lot of new information today. Now each of us will pick one of the five technologies we learned and create a picture that will help us remember that technology. Since this is a picture or illustration, we will not be using any words in our drawing.

When you hear the word DRAW, take out one of your station worksheets. On the back of this worksheet draw an illustration that represents that technology. Use the markers provided. What questions do you have? DRAW.

Application

Extended classroom activity:

Watch the YouTube video Grass to Glass. This video shows RFID tags, milking carousel, and biotechnology.

FFA activity:

At the next FFA meeting have the fun activity be a scavenger hunt using portable GPS units.

SAE activity:

Visit a local producer that uses GPS in their tractors or RFID tags.

Evaluation

MS.AST.4.1.ASSESS.A.

Answers to Evaluation

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



Emerging Technology Evaluation

Name: _____

Directions: Match the technology with its correct definition. Write the letter on the blank.

_____ 1. Global Positioning Systems

A. These are used to shear sheep, weld, and harvest crops.

_____ 2. Robotics

B. This technology can even send text messages to your phone when problems exist.

_____ 3. NASA

C. Satellites help see how "green" Earth is

_____ 4. RFID

D. Eventually combines using this will harvest a field without an operator.

_____ 5. Phone-controlled sprinklers

E. This uses radio frequency to identify livestock and collect data.

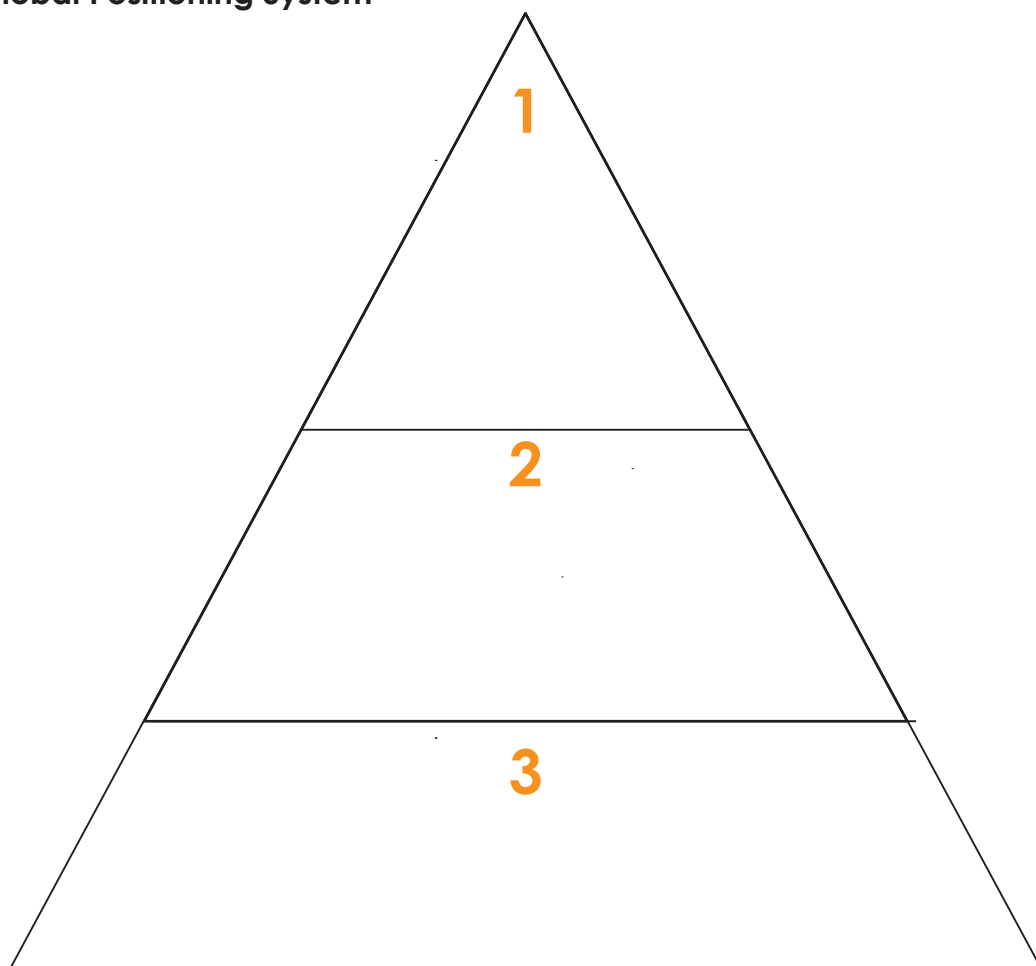


Emerging Technology Stations

Name: _____

Directions: At each station read the information card describing the technology. Next watch the short video clip on that technology. Once those two tasks are completed, fill out each of the technology triangles on your worksheet. Write three facts you learned, two advantages from this technology, and one question you have about the technology.

Station 1: Global Positioning System



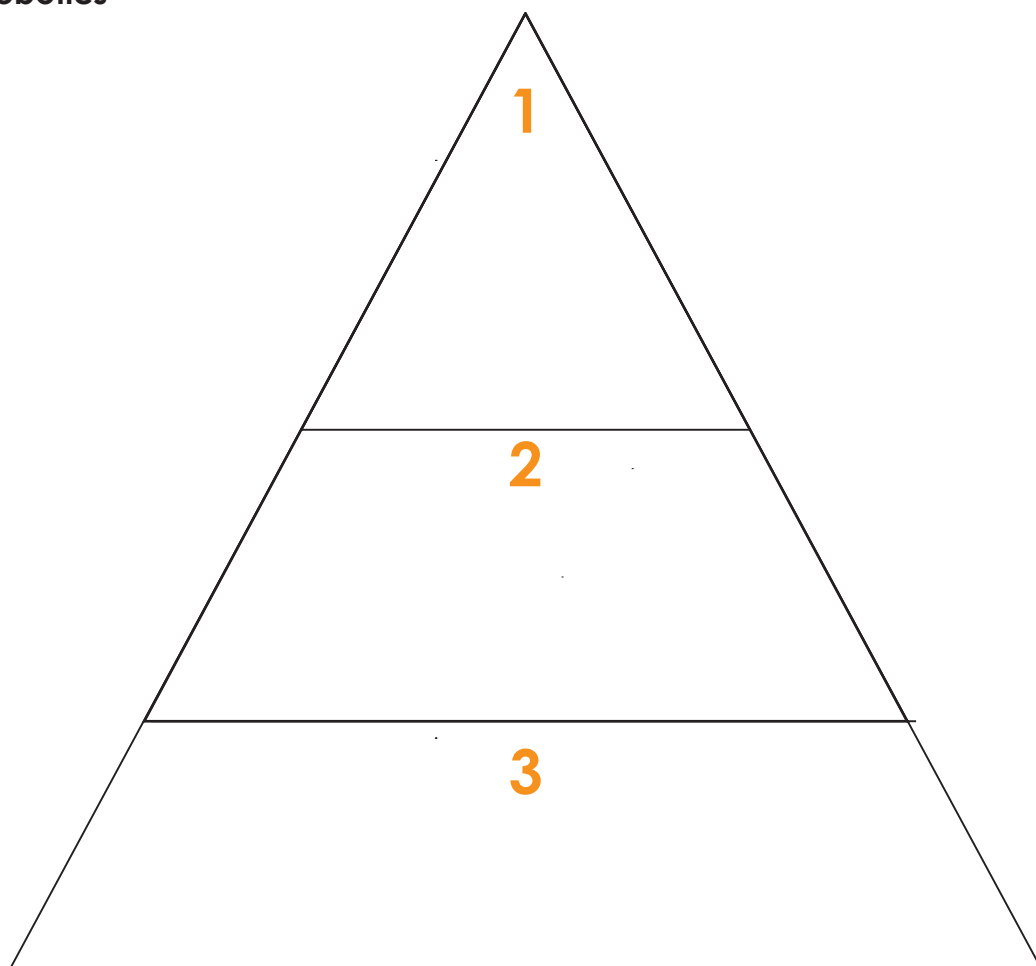


Emerging Technology Stations

Name: _____

Directions: At each station read the information card describing the technology. Next watch the short video clip on that technology. Once those two tasks are completed, fill out each of the technology triangles on your worksheet. Write three facts you learned, two advantages from this technology, and one question you have about the technology.

Station 2: Robotics



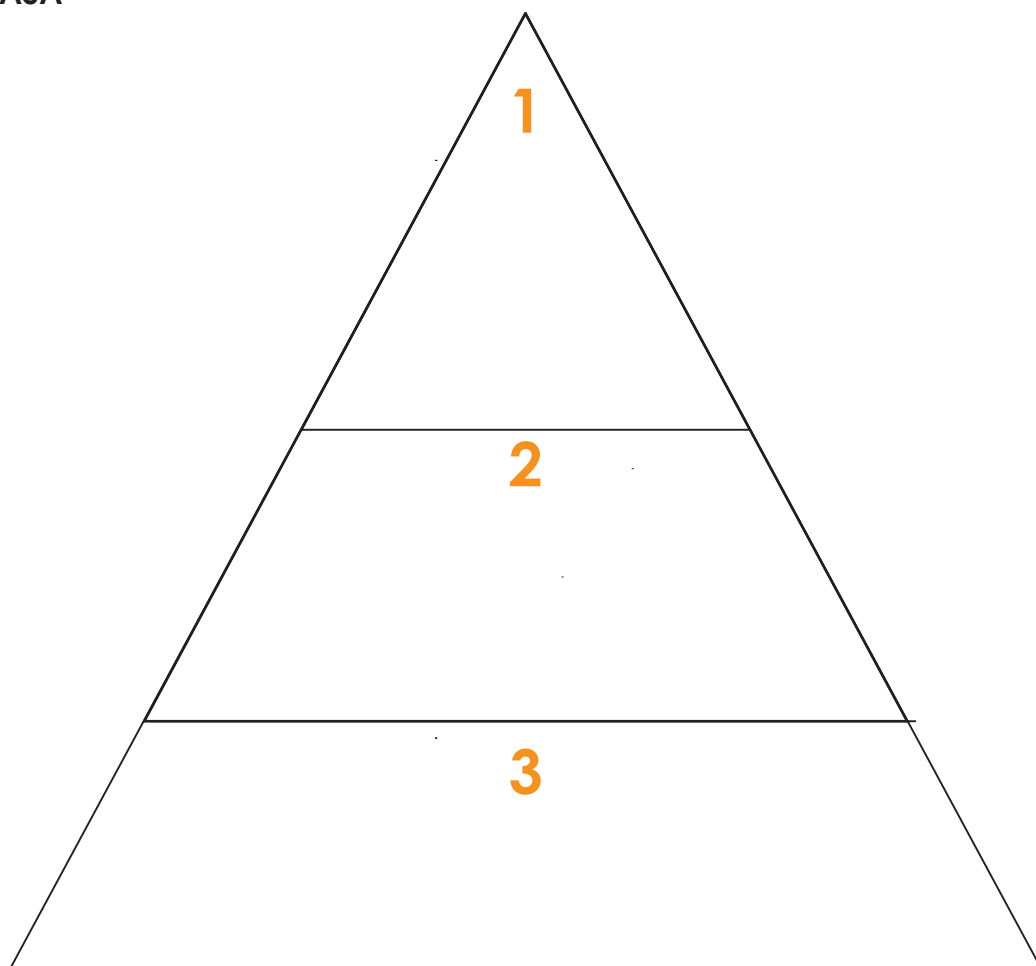


Emerging Technology Stations

Name: _____

Directions: At each station read the information card describing the technology. Next watch the short video clip on that technology. Once those two tasks are completed, fill out each of the technology triangles on your worksheet. Write three facts you learned, two advantages from this technology, and one question you have about the technology.

Station 3: NASA





Emerging Technology Stations

Name: _____

Directions: At each station read the information card describing the technology. Next watch the short video clip on that technology. Once those two tasks are completed, fill out each of the technology triangles on your worksheet. Write three facts you learned, two advantages from this technology, and one question you have about the technology.

Station 4: Radio Frequency Identification

A large equilateral triangle is shown, oriented with its base at the bottom. Two horizontal lines divide the triangle into three distinct sections. The top section is a small triangle, the middle section is a trapezoid, and the bottom section is a larger trapezoid. Each section is labeled with a large orange number: '1' in the top section, '2' in the middle section, and '3' in the bottom section.

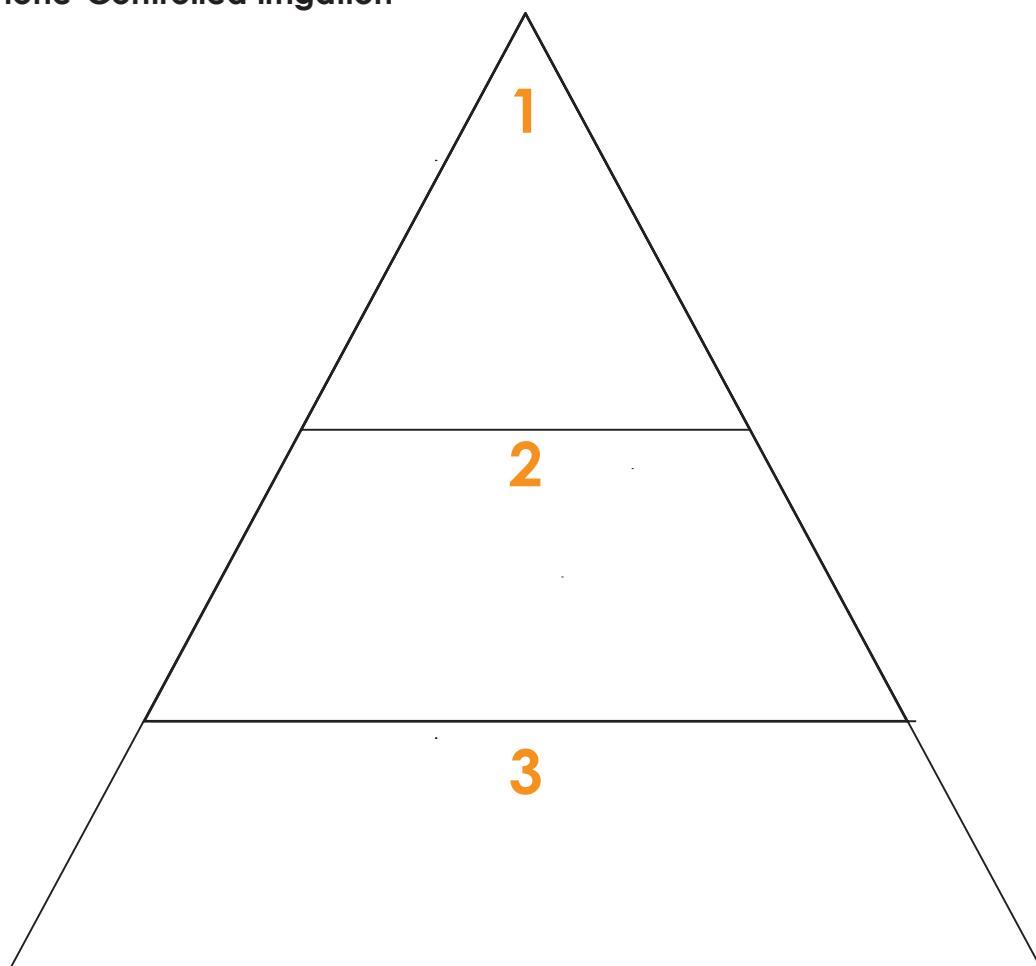


Emerging Technology Stations

Name: _____

Directions: At each station read the information card describing the technology. Next watch the short video clip on that technology. Once those two tasks are completed, fill out each of the technology triangles on your worksheet. Write three facts you learned, two advantages from this technology, and one question you have about the technology.

Station 1: Phone-Controlled Irrigation





Station 1:

Global Positioning Systems

What is it?

Uses satellites in space to pinpoint a tractor's exact location in a field. Global Positioning Systems (GPS) allow farmers to actually produce maps of their fields. These maps tell a farmer important information such as soil type, moisture, yield of crop, and even weed and insect problems. This information allows the farmer the precision to apply just the right amount of tillage, fertilizer, herbicide, seeds, or even irrigation water. GPS greatly reduces waste of materials and the field gets exactly what it needs. In the end it will reduce expenses and help the farmer get a better crop yield. In the future, GPS will be used to harvest a field without a driver or a remote operator.

Watch the YouTube video Precision Farming.

- **Complete your technology triangle:**
 - **Write three facts**
 - **Write two advantages**
 - **Write one question**



Station 2: Robotics in agriculture

What is it?

Robotics is a very exciting field in agriculture. Robots are being used more and more in agriculture. Robotics are used to milk cows, shear sheep, harvest fruit, and weld metals together. These robots help decrease the amount of labor producers have to do. Robots are also very useful in completing tasks that are more dangerous to humans.

Watch the YouTube video Lely Astronaut A3 Milking robot

- **Complete your technology triangle:**
 - **Write three facts**
 - **Write two advantages**
 - **Write one question**



Station 3: NASA and agriculture

What is it?

NASA satellites provide large amounts of data about how we grow food on planet earth. They let us know how “green” regions of the world are. This allows us to see how many crops are growing and if that crop is doing well. This information is useful because then we can predict which nations will have food shortages. Food prices, food trade and aid decisions can be made because of NASA's data.

Watch the YouTube video NASA Science for a Hungry World: Part 2

- **Complete your technology triangle:**
 - **Write three facts**
 - **Write two advantages**
 - **Write one question**



Station 4: Radio Frequency Identification and agriculture

What is it?

Radio Frequency Identification (RFID) is becoming more and more commonplace. It can be inserted or applied on an animal, object, product, and even a person to help identify and track them. One example in agriculture is its use in dairy cattle operations. When a cow enters to get milked, her tag is read and she is given a predetermined amount of food. The producers can track how much milk she gives a day, how many times she is milked, and how much she eats. There are numerous other examples used outside of the agriculture industry, ranging from tracking inventory in stores to having RFID in our vehicles to bypass tollbooths.

Watch the YouTube video Mind Blowing Cow Technology: Bella Health Systems at WAE

- **Complete your technology triangle:**
 - **Write three facts**
 - **Write two advantages**
 - **Write one question**



Station 5: Phone-controlled sprinklers

What is it?

For individuals that own or manage many different properties such as a school district or a city making sure all its lawns are properly irrigated can be a very big task. Also, people are always looking for ways to save a few extra dollars. There are irrigation systems that can control hundreds of sites and monitor weather conditions from one central location. This could be through your telephone, cellular modem, radio frequencies, and cable connections. Many of these designs also send alerts to this central location when there are problems with the irrigation system.

Watch the YouTube video Mobile Application to Remote Control Irrigation Pump.

- **Complete your technology triangle:**
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