

# Where's the bacon?

An introduction to vulnerabilities in  
agricultural systems

FACILITATOR GUIDE | AGRICULTURAL CYBERBIOSECURITY ACTIVITY



<https://doi.org/10.21061/cyberbiosecurity>

Adapted by Kindred Grey from "Agricultural Cyberbiosecurity" by David Smilnak, Anne Brown, Joseph Simpson, Jaylan Day, and Hannah Scherer from <https://doi.org/10.21061/cyberbiosecurity>. CC BY-NC-SA 4.0. Includes picture by Monstera (2020), Pexels license, <https://www.pexels.com/photo/focused-little-girls-with-microscope-in-room-5063442/>; picture by NASA Goddard Space Flight Center (2018), CC BY 2.0, <https://flic.kr/p/NYokoi>; and picture by COD Newsroom (2017), CC BY 2.0, <https://flic.kr/p/Sz4zJK>.

## Activity overview and background information:

This activity guides participants through a “Clue” style problem where they will have to critically assess the given information and determine the most likely cause of the problem in the scenario. The purpose of this activity is to facilitate problem-solving, critical reflection, and systems thinking. It prompts participants to draw connections between agriculture, cyberbiosecurity, and complex systems.

The scenario is set up to introduce the foundational concept of an interconnected agricultural system and the role of cyberbiosecurity in ensuring that agricultural systems function effectively and safely. For background information on cyberbiosecurity concepts in this activity, please see the following Fact Sheets in the Cyberbiosecurity Education Resource Collection at <https://doi.org/10.21061/cyberbiosecurity>

- Cyberbiosecurity
- Biosecurity

## SOLs and CTE competencies:

- CS 6.6: identify physical and digital security measures used to protect electronic information.
- CS 7.7: identify existing cybersecurity concerns associated with Internet use and Internet-based systems and potential options to address these issues.
- CS 8.6: evaluate physical and digital security measures used to protect electronic information.
- CS 8.7 identify impacts of hacking, ransomware, scams, fake vulnerability scans, and the ethical and legal concerns involved.
- Ag 8004: Explore the food industry as it relates to agriculture, agriscience, and agribusiness.
- CTE Prof Comp: Demonstrate an understanding of information security. Includes: describing cybersecurity (e.g., risks, threats, vulnerabilities).
- Sci 6.9: investigate and understand that humans impact the environment and that individuals can influence public policy decisions related to energy and the environment.

## Learning objectives:

1. Define cyberbiosecurity.
2. Describe interconnections between components of agricultural systems.
3. Identify roles that people play in cyberbiosecurity concerns affecting agricultural systems.

## Time: 60 minutes

This activity can be done all at once or in three or four 15–20-minute sessions (e.g., as a warm-up activity).

## Vocabulary:

1. **Cyberbiosecurity:** Efforts to identify and minimize the weak spots between biosecurity, cybersecurity, and cyber-physical security to help safeguard our data and our systems.
2. **Cybersecurity:** Protection of computer systems and networks from the theft of or damage to their hardware, software, or electronic data, as well as from the disruption or misdirection of the services they provide.
3. **Biosecurity:** Procedures intended to prevent the introduction and/or spread of harmful organisms in order to minimize the risk of transmission of infectious diseases to people, animals, plants, and the environment caused by viruses, bacteria, or other microorganisms.
4. **Cyber-Physical Security:** Protection of physical and engineered systems whose operations are monitored, controlled, coordinated, and integrated by a computing core. Examples of cyber-physical systems include modern automobiles and medical devices.
5. **Agricultural system:** A set of interacting and interdependent components that work together to achieve the overall purpose of producing crops and raising livestock to produce food, fiber, and energy.

## Materials, supplies, and activity prep:

### 1. Youth Activity Guide

Participants need a copy of the Youth Activity Guide to work through. This can be provided either in hard copy or electronically, but the activity is designed to be done on paper.

PDF and customizable versions of the guide can be downloaded from the Cyberbiosecurity Education Resource Collection at <https://doi.org/10.21061/cyberbiosecurity>

### 2. Cards – 1 set per group

There are 16 clues provided on printable masters at the end of this guide. Cards will need to be printed and cut up prior to the activity. Each group will need one set of cards.

### 3. Card Sorting Guide Handout (optional)

A handout is provided at the end of this guide that can be used to help participants organize their cards and ideas as they work through the activity. 2-3 copies per group may be helpful as the page is limited to 4 options.

## Safety:

There are no special safety concerns for this “pencil and paper” activity.

## Setting the stage:

1. Distribute materials: Youth Activity Guide and Pencils
2. Assign teams: Pairs or groups of 3-4 will be helpful to promote discussion and idea sharing
3. Set the stage: Use the following text to engage the participants and get them ready for the activity

*Attention agricultural cyberbiosecurity agents! You have been assigned to an ongoing case that requires your expert problem-solving skills and your ability to draw connections between agricultural, biological, and cyber systems. Understand that this case is full of twists and turns. Things may not appear as they seem. Proceed with caution and rely on your logic and wit to solve the case!*

## Activity facilitation steps:

There are 4 parts to this activity, as described here. In each part, participants receive new information about the scenario on a set of cards. They evaluate the information and develop their ideas about what happened based on the evidence that they have. In each stage, they receive new information that helps clarify the situation. The Youth Activity Guide has the introductory scenario and guides them as they work through the new information provided in each part.

### The Scenario Part 1

Purpose: Introduce the scenario and provide initial information from different parts of the food system. Participants will review new information, identify options for the cause of the problem, and begin to narrow down options.

#### **Instructions: Review the following with participants (read aloud, etc.)**

*The other day I was in my local grocery store deciding what I wanted to have for dinner, strolling down the aisles, I started noticing that shelves were missing some items. Since I have been in the store before and seen this occurrence I wasn't too concerned. So, I decided that I wanted to have pork chops, applesauce, mashed potatoes, gravy and corn, and homemade rolls. I found all the items except for the pork chops. There wasn't one pork chop to be found. So, I decided I could fry up some ham instead. I looked for some of the ham that you just had to warm up you know? The kind that was already cooked? I looked and looked and NOT one ham. Not even the kind you have to cook. Now I am frustrated!! What's up? I got into my car and drove to another grocery store and found the same situation. Not one pork product was available in that store! What's Up? There is NO BACON! Are you... Kidding me?*

*Your job as cyberbiosecurity agent is to figure out what is going on! Why are there no pork products in my stores?*

## The Scenario Part 1 (Cont.)

### Instructions: Provide directions to participants

*As a group, you will use the information on the cards to determine different options for what might be going on. Record your options on your activity sheet. Group your information cards with your options on the activity sheet.*

**Instructions: Hand out Part 1 Cards (#1-4) and read the more detailed descriptions aloud. For each card, groups should determine the sector that they think this information relates to and record this on their activity sheet. The 4 options include: transportation, processing & packaging, producer, aliens.**

Card 1: Number of available truck drivers reduced; delivery times increased

- *A news briefing by the United States Secretary of Commerce Gina Raimondo revealed that the impacts of COVID-19 have reduced the number of available truck drivers and increased delivery times.*

Card 2: Excess supply of pigs

- *Local farms are reporting an abundance of pigs/hogs, creating an excess in supply. The excess amount of pigs and hogs available significantly lowered the wholesale price of pork.*

Card 3: Few orders for pork products have shipped from processing plants

- *Very few orders for pork products have been shipped from any processing plants to grocery stores or distribution centers.*

Card 4: Crop circles look like pig profiles

- *A news reporter interviewed a local farmer who had 5 crop circles that resembled a pig's profile.*

## The Scenario Part 2

Purpose: Provide additional information to participants for them to consider more interactions and other perspectives on cyberbiosecurity and the food system. Participants should narrow down their options based on their critical evaluation of new information and be able to justify their choices.

**Instructions: Provide directions to participants then Hand out Part 2 Cards (#5-9) and read the more detailed descriptions aloud.**

*As a group, use the information provided on the new cards to add additional information to the options for what might be going on. Based on the new information, eliminate any options that you no longer think are the cause.*

Card 5: Delivery drivers needed

- ***Delivery drivers are needed and there was an abundance of commercials advertising companies hiring. Some were even offering signing bonuses of \$5,000.00.***

Card 6: Delivery times long in general, but food commodities not reporting problems

- ***Delivery times, including UPS, FedEx, and the U.S. Postal Service experiencing a record low success rate on delivery times. Customers were getting angry over the delays. However, there were no problems reported on food commodities or wholesale products.***

## The Scenario Part 2 (Cont.)

Card 7: No issues with employee attendance at processing and packaging plants

- *Processing and packaging plants have reported no cases of COVID among their employees for the last month. As a matter of fact, 4 plants had perfect attendance and zero accidents.*

Card 8: Crop circles revealed to be a hoax

- *The farmer who reported crop circles resembling a pig's profile admitted making it up as a publicity stunt to drive interest in his new agritourism business.*

Card 9: Current pork production at record high; wholesale cost lowest in 3 years

- *Statistics on pork production in the U.S. from the National Daily Hog and Pork Summary from the USDA Livestock, Poultry & Grain Market News site indicate that current production is at a record high. This record-high production rate has caused the wholesale cost of pork to be the lowest market cost in the last 3 years. This is due to the supply and demand concept.*

## The Scenario Part 3

Purpose: Narrow down options to the most likely source of the problem.

**Instructions: Before getting new information, teams should determine their top choice for the part of the system that is most likely causing the problem. Lead a discussion with participants allowing for them to share their ideas.**

Note: The evidence provided leads to the *packaging and processing plant* as the source of the problem, so if there are teams that disagree, ask them to revisit their evidence for their option. Move on to the next step once the whole group agrees on the plant as the source.

## The Scenario Part 4

Purpose: Examine additional information to determine the root cause of the problem and develop a defense of their idea.

**Instructions: Provide directions to participants then Hand out Part 4 Cards (#10-16) and read the more detailed descriptions aloud.**

*In this step, you will be provided additional information about the packaging and processing plant. Your job is to determine the root cause of the problem. Based on this new information you should develop a defense for your idea about what happened at the plant.*

Card 10: Spike in foodborne illnesses traced to pork

- *Last night on the news there was a story on the spike in salmonella and E.coli cases in 17 states. 60 deaths occurred from these foodborne illnesses. An investigation was conducted and determined the source to be pork.*

Card 11: Mass contamination issue in automated system at pork processing/packaging plant

- *Pork Processing/Packing plant reported a mass contamination issue caused by mixing waste products with processed meat in an automated system controlled by computers. The plant stated that this was not a human error in the plant!*

Card 12: The computers at the plant are backed up nightly

- *Interview with the plant's computer systems administrator reveals that the computers at the plant are backed up nightly.*

Card 13: Security updates are performed daily at the plant

- *In an interview, the information security analyst for the plant described their efforts to plan and carry out security measures to protect the plant's computer networks and systems. As part of these measures, security updates are performed daily at the plant.*

## The Scenario Part 4 (Cont.)

Card 14: Employees at plant have reported no issues with accessing the computers

- *Interviews with operators, supervisors, and maintenance technicians at the processing and packaging plant revealed that they have not noticed anything wrong. They are able to access the computer systems to perform their daily duties.*

Card 15: One employee at plant reported that their password was stolen online

- *An employee received an email that their password for logging into the plant's automation system was changed. They knew that they did not change their password, so they immediately notified their supervisor, who informed the plant's information security analyst and computer systems administrator.*

Card 16: One plant employee's social media account was hacked

- *An employee started getting calls and texts from friends and family telling them that they had seen a bunch of strange posts by them through one of their social media platforms. They suspected that the account was hacked, so they immediately changed their password and let people know that their account may have been compromised.*

## Conclusion

Purpose: Provide an end result and develop a critical understanding of the topic. Examine the issue and determine potential implications of a malware attack.

**Instructions:** Using the guiding questions in the Activity Guide, teams should make a final determination of the root cause of the problem, summarize key evidence that informed their decision, determine who is impacted, and develop ideas to fix the problem. Give teams an opportunity to share their thoughts on the problem. Lead a synthesis discussion about the complexity of the food system and vulnerabilities revealed through this scenario. The evidence points to a malware attack.

## Processing questions

### Share

What are the components of an agricultural system?

### Generalize

How does thinking about agriculture as a system help us identify potential problems and solutions?

### Apply

What ideas do you have for reducing cyberbiosecurity risks in agricultural systems?

# Acknowledgments

This activity was developed by Teresa Lindberg. Hannah H. Scherer, David Smilnak, Donna Westfall-Rudd, Joseph Simpson, and Erika Bonnett provided editorial support. It was reviewed by additional members of the project team and advisory board, including Sally Farrell and Jonette Mungo.

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# About this project

Cyberbiosecurity is an emerging field that focuses on creating security measures for digital aspects of our food and agriculture systems, creating a structure and opportunity for a safe food system that can meet the large needs of a growing population and world. This educational resource was developed as part of a project to support formal and non-formal agricultural educators in integrating cyberbiosecurity topics and research-based strategies for engaging middle-school-aged girls in STEM into their educational programs.

The entire resource collection can be accessed here: <https://doi.org/10.21061/cyberbiosecurity>

The project is an outreach effort of the Virginia Tech Center for Advanced Innovation in Agriculture.



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<p>3</p> <p><b>Few orders for pork products have shipped from processing plants</b></p>	<p>4</p> <p><b>Crop circles look like pig profiles</b></p>
<p>5</p> <p><b>Delivery drivers needed</b></p>	<p>6</p> <p><b>Delivery times long in general, but food commodities not reporting problems</b></p>
<p>7</p> <p><b>No issues with employee attendance at processing and packaging plants</b></p>	<p>8</p> <p><b>Crop circles revealed to be a hoax</b></p>



9

**Current pork production at record high; wholesale cost lowest in 3 years**

10

**Spike in foodborne illnesses traced to pork**

11

**Mass contamination issue in automated system at pork processing/packaging plant**

12

**The computers at the plant are backed up nightly**

13

**Security updates are performed daily at the plant**

14

**Employees at plant have reported no issues with accessing the computers**

15

**One employee at plant reported that their password was stolen online**

16

**One plant employee's social media account was hacked**



# Ideas for cause of the problem:

Idea: \_\_\_\_\_

Eliminated?

Why?

Place relevant information  
cards here

Idea: \_\_\_\_\_

Eliminated?

Why?

Place relevant information  
cards here

Idea: \_\_\_\_\_

Eliminated?

Why?

Place relevant information  
cards here

Idea: \_\_\_\_\_

Eliminated?

Why?

Place relevant information  
cards here



## About these templates (and open educational resources)

### What is an open educational resource?

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This definition of OER is provided by [The William and Flora Hewlett Foundation](#).

### How to access these templates

The main landing page for these resources is <https://doi.org/10.21061/cyberbiosecurity>.

This page includes a downloadable and editable Word document for the:

- Student fact sheet
- Student activity sheet
- Faculty guide

### Did you know that you can customize and share your version of this resource?

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\*Best practice is to list the title, author, source, and license.

Example: Adapted by [your name] from "Agricultural Cyberbiosecurity: Big Data" by David Smilnak, Anne Brown, Joseph Simpson, Jaylan Day, and Hannah Scherer from <https://doi.org/10.21061/cyberbiosecurity>. [CC BY-NC-SA 4.0](#).

# Style guide

## Student fact sheet

- Headers
  - Font: Baloo Bhaijaan (should already be installed in Microsoft Word)
  - Size: 18
  - Color: #E58F00 (orange), #5A6A45 (green), #7E7495 (purple)

## Student activity sheet

- Headers
  - Font: Baloo Bhaijaan (should already be installed in Microsoft Word)
  - Size: 18
  - Color: #8498B2 (blue)

## Faculty guide

- Headers
  - Font: Baloo Bhaijaan (should already be installed in Microsoft Word)
  - Size: 18
  - Color: #8498B2 (blue)

## Body text (for all 3 templates)

- Font: Encode Sans (can be downloaded [here](#) if not already in Microsoft Word)
- Size: 11
- Color: #000000 (black)

You can add more pages to any template by clicking insert > blank page. Copy the background image and paste onto your blank page.

All text should be justified (  ) and have a line spacing of 1.15 (  ).

## Elements to copy & paste into the student activity sheet

### About this activity

Write your text here.

### You will need:

1. Write text here.
2. Write text here.
3. Write text here.

### STEP

Write text here.

1

# Elements to copy & paste into the student fact sheet

## Fun fact!

Type your text here.

## Introduction

Type your text here.

Type your text here.

Figure caption

