Lesson 7: Hog Wild: Fluctuations in Commodities Markets

Overview

This model illustrates how a commodity often oscillates over time based on supply, demand, and price. Students explore a pork commodity, comparing simulation results given two scenarios for large and small farms.

Learning Goals:

- Represent and interpret data on a line graph.
- Identify producers (the supply side) and consumers (the demand side) in the model.
- Articulate the role of price in a marketplace.
- Explain what happens to price when the supply is low and how that affects producers.
- Illustrate the path to market for a commodity.
- Compare large-scale farming to small-scale farming in terms of impact and practicality.

Figure 1: Title Screen

Student Challenge

As a journalist writing for the local newspaper, investigate small versus large-scale farming practices and report on the impact and practicality of different methods.

Lesson 7 – Level C – Ages 13+
Time: 3-4 periods

Materials:

- One computer for every 2-3 students
- Simulation online at http://www.clexchange.org/curriculum/complexsystems/oscillation/oscillation_commoditiesC.asp
- Handouts (See pages 5-16)

Curricular Connections:

- Math: Vary assumptions, explore consequences, and compare predictions with data.*
- National Curriculum Standards for Social Studies: How people organize for the production, distribution, and consumption of goods and services; scarcity of resources; and economic needs versus wants.
- Economics: Prices send signals and provide incentives to buyers and sellers.

*Common Core Standards

Key system dynamics concepts and insights:

- Interdependencies exist among inventory, demand, and price and tend to create oscillations over time.
- Delays are inherent in adjusting supply of a commodity.

Lesson Details

Preparation:

1. Create groups of two to three students each.
2. Check computers to make sure you can access the online simulation.
3. Copy each handout double-sided for each student. See the chart below to determine how many copies of each handout you'll need.

#	Page	Handout	Description
1	5-6	Introduction	This section includes instructions for assembling a learning portfolio and an assessment rubric. Students then get started on the simulation using step-by-step directions.
2	7-12	Scenario Runs	Students experience two farming scenarios and then create their own "hybrid" farm.
3	13-15	Debrief	Students step through the debrief components to reflect on simulation trends and structures.
4	16	Commodity Comparison	After completing the comparison, students write an article.

4. Optional: You may want to read the background information about the underlying structure of the model. This can be useful as you guide students to understanding the model behavior as it relates to real-world behaviors and the limitations of the model. See "Commodity Model Background Info," available as a separate file for download.

Lesson Sequence:

1. Introduce students to any specific content knowledge related to commodities that you'd like them to have prior to running the simulation. This may include definitions of terms such as commodity, supply, demand, inventory, production, distribution, and price.
2. Have students open the simulation and work through the simulation introduction, runs, and debrief using the guided handouts. Note that the handouts guide students through the simulation in a step-by-step manner. If you'd like to leave the exploration more open, then you may wish to eliminate some of the handouts. Figure 2 shows the control panel screen.

Lesson Details

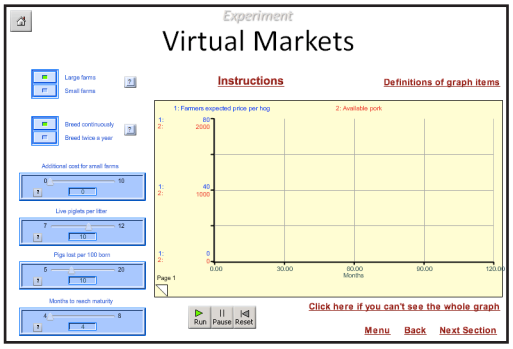

Figure 2: Control Panel

Debrief and Assessment:

1. Using the instructions and rubric, have students assemble their portfolios and write their article. Note that a number of additional resources are available for students to research in Learn More section on the debrief screen.
2. One additional option is to ask students to create a presentation of their findings. Peers could ask questions and give feedback to one another using aspects of the same rubric.
3. Debrief the simulation experience as a class, using ideas for bringing the lesson home.

Bringing the Lesson Home:

Discuss these and any other questions/topics that have surfaced about model behaviors.

- What causes fluctuations in price, supply, and demand for a commodity?
- How do decisions about the production and distribution of products affect scarcity?
- What is the role of advertising in food production systems?
- What are benefits and tradeoffs of farming on a large scale in comparison to a small scale?
- What determines whether or not a food production system is considered good or bad?
- What are benefits and tradeoffs of raising a single breed of pig, the "domestic pig," versus rarer heritage breeds?
- How do views about animal rights vary around the world?

Assessment Ideas:

Using a rubric, students assemble a portfolio and write an article describing their findings and implications.

Acknowledgements:
Lesson 7 - Hog Wild: Fluctuations in Commodities Markets - Level C

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Model created with contributions from
Jennifer Andersen, Anne LaVigne, Mike Radzicki, George Richardson, Lees Stuntz,
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Hog Wild: Fluctuations in Commodities Markets - Introduction

You are a journalist for the local newspaper. Your assignment is to report on the local pork industry. In preparation for writing the article, you will compare some methods used on small and large farms. You'll explore the simulation sections (in bold) as indicated. Remember, you can always revisit a section anytime you like. Keep in mind that this topic is much more complex than the results within the simulation. You can explore the topic further using the additional resources section before writing your article.

The newspaper's editor, Mr. Wright, will score your article and research portfolio with a rubric (see below). At the conclusion of this project, you will need the following organized into a portfolio.

1. Your 800-1200 word article for the "Smithtown Daily Herald"
   - Article title
   - Your name as the article's author
   - One or more related illustrations for your article that show parts of the system and how they are connected
2. Handouts 1-4, complete and organized neatly in order
   - Handout 1 – Introduction, Instructions, and Rubric
   - Handout 2 – Scenario Runs
   - Handout 3 – Debrief
   - Handout 4 – Commodity Comparison

Project Assessment Rubric

	Novice	Basic	Proficient	Advanced
Article	Little to no explanation of the data is included. Comparison is non-existent or very confusing.	Some explanation of the data is included, but it includes little detail and has some inaccuracies. Comparison is somewhat unclear and/or incomplete.	Explanations are clear and directly link to the data on the graphs. A clear comparison between the two farm types and effects on the commodity, farmers, and consumers are included.	In addition, the article describes interconnections among the trends that directly impact the commodity, farmers, and consumers over time.
Article Illustration	No illustration is included.	Illustration is included, but it is not clearly linked to the system.	Illustration clearly show key aspects of the system.	In addition, the illustration clearly shows cause-and-effect relationships.
Data and Explanations (within the simulation handouts)	Little to no data is included.	Some data is included, but it is not clear or accurately recorded. Minimal explanations of results are included.	The recorded data is relevant, accurate and clearly represented. Explanations are included that link graph results to logical conclusions.	In addition, the data includes clear connections and explanations among results seen on different graphs.

Introduction (continued)

Open the *Hog Wild: Fluctuations in Commodity Markets-Level C* simulation at http://www.clexchange.org/curriculum/complexsystems/oscillation/oscillation_commoditiesC.asp and **click** "Start."

Click 1. Introduction – Hog Farming.

Read the introduction. **Click** and read all the sections on this page. Then answer the following:

a. Define piglet, pig, hog, gilt, sow, and boar.

b. What are your initial thoughts about why the number of customers at farmers markets is growing?

c. Describe your role as a journalist.

Click Menu.

Click 2. Experiment with the Model.

Click the question marks (?) for the buttons and slidebars and write definitions in your own words.

Large vs. small farms:

Breeding continuously vs. breeding twice a year:

Additional cost for small farms:

Live piglets per litter:

Pigs lost per 100 born:

Months to reach maturity:

Scenario Runs

Scenario #1 – Large Farms:

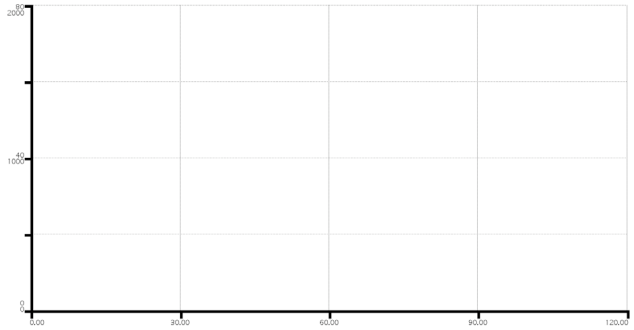
a. Given the settings below, what do you predict will happen to the farmers expected price per hog and the available pork over time?

b. Set the simulation as shown below and then run.

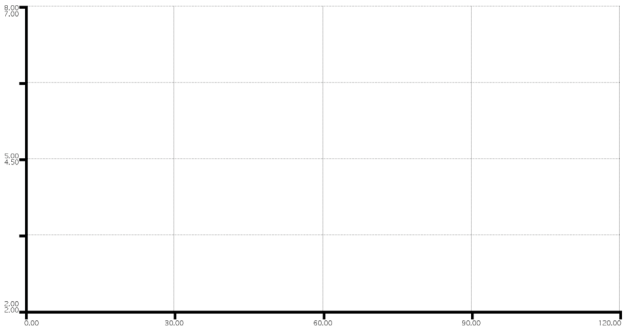
Decision	Setting
Type of farm	large
Breeding plan	breed continuously
Additional cost for small farms	$ 0
Live piglets per litter	10 piglets
Pigs lost per 100 born	10 pigs
Months to reach maturity	4 months

c. Record your results on the graphs below. **Click** on the bottom-left corner of the graph to see Page 2. Make sure to create labels and a key.

Farmers expected price per hog and Available pork



Retail pork price and
Pork eaten per person per month



Scenario #1 – Large Farms (continued)

d. What do you notice about the graphs' trends?

e. Why do you think this occurred? Include specific information about how the large farm settings affected the situation.

Click on the bottom-left corner of the graph to see Page 3.

f. What happened to the number of piglets and mature hogs over time?

g. How do these graphs relate to the retail pork price and the amount of pork eaten per person per month graphs?

Click on the bottom-left corner of the graph to see Page 4.

h. Did the farmers make a profit on the sale of pork over time? Explain why. Notice that the breakeven line shows zero profit. Above that line is a profit, and below the line is a loss.

Scenario #2 – Small Farms

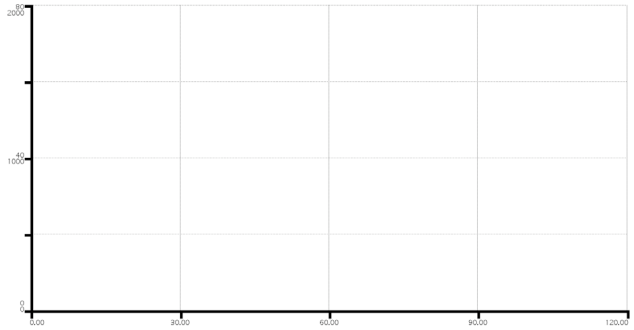
a. Given the settings below, what do you predict will happen to the farmers expected price per hog and the available pork over time?

b. Set the simulation as shown below and then run.

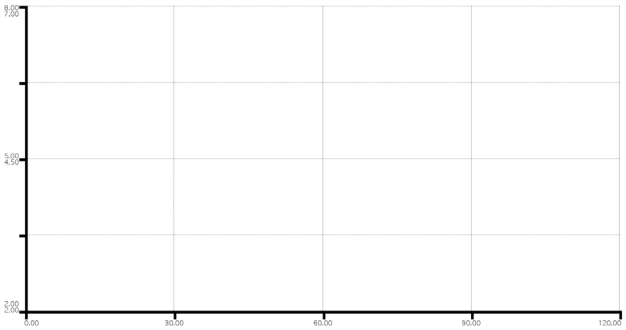
Decision	Setting
Type of farm	small
Breeding plan	breed twice a year
Additional cost for small farms	$ 10
Live piglets per litter	7 piglets
Pigs lost per 100 born	20 pigs
Months to reach maturity	8 months

c. Record your results on the graphs below. **Click** on the bottom-left corner of the graph to see Page 2. Make sure to create labels and a key for each graph.

Farmers expected price per hog and Available pork



Retail pork price and
Pork eaten per person per month



Scenario #2 – Small Farms (continued)

d. What do you notice about the graphs' trends?

e. Why do you think this occurred? Include specific information about how the small farm settings affected the situation.

Click on the bottom-left corner of the graph to see Page 3.

f. What happened to the number of piglets and mature hogs over time?

g. How do these graphs relate to the retail pork price and the amount of pork eaten per person per month graphs?

Click on the bottom-left corner of the graph to see Page 4.

h. Did the farmers make a profit on the sale of pork over time? Explain why.

Scenario #3 – Design a Farm

a. Now it's your turn to set up a farm. You can set up the simulation however you'd like, but consider whether the settings will work in real life. Write a short paragraph describing aspects of the farm. Description:

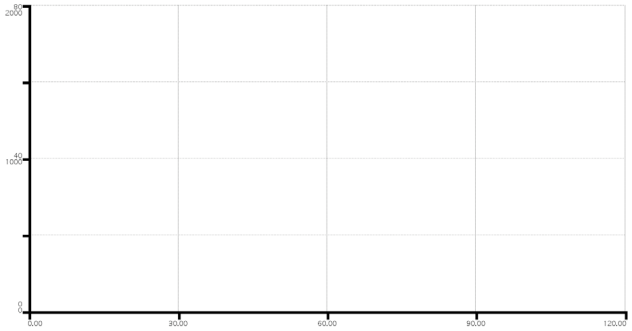
b. Set up the simulation, record your settings, make a prediction about what will happen, and then run.

Prediction:

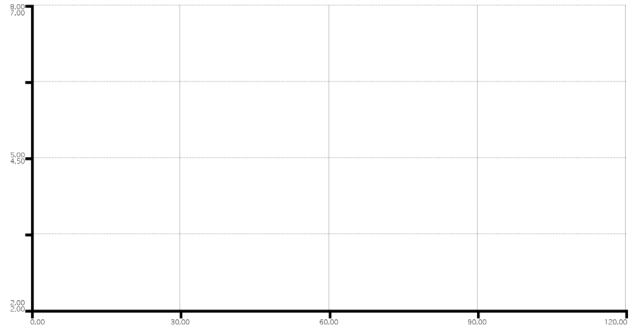
Decision	Setting
Type of farm	
Breeding plan	
Piglets per litter	
Pigs that die per 100	
Extra cost per hog	
Time to raise	

c. Record your results on the graphs below. Make sure to create labels and a key for each graph.

Farmers expected price per hog and Available pork



Retail pork price and
Pork eaten per person per month



Scenario #3 – Design a Farm (continued)

d. What do you notice about the graphs' trends?

e. Why do you think this occurred? Include specific information about how your farm settings affected the situation.

Click on the bottom-left corner of the graph to see Page 3.

f. What happened to the number of piglets and mature hogs over time?

g. How do these graphs relate to the retail pork price and the amount of pork eaten per person per month graphs?

Click on the bottom-left corner of the graph to see Page 4.

h. Did the farmers make a profit on the sale of pork over time? Explain why.

Debrief

Click Menu. **Click 3. Debrief Central.** You'll go through each of these sections of the debrief to process what you experienced in the simulation.

Click A. Behavior Patterns. Read "Large Farms and Cycles."

a. Looking at the lines on the graph, why do you think farmers on large farms experience cycles in the expected price for their hogs?

b. Why would the availability of pork seem to "follow" what price farmers think they will receive for their hogs? For example, if the price goes up, then so does the availability.

Click and read What's really happening.

c. Draw a diagram to show relationships among supply of pork, demand for pork, and price of pork.

Click Back and Continue. Read "Trying to Keep Up."

d. Looking at the lines on the graph and the settings, why do you think the cycles become larger over time?

Click and read What's really happening.

e. Why do you think it takes longer for farmers to bring down the inventory of pigs than it does for people to change their eating habits?

Click Back and Continue. Read Small Farms and Growth.

f. Why do you think the lines on this graph look very different from the previous graphs?

Debrief (continued)

Click and read What's really happening.

g. What is your understanding of why the small farms are not experiencing the "wild" ups and downs?

Click Back and Continue. Read "Immune to the Ups and Downs?" and What's really happening?

h. Why does higher efficiency create more extreme ups and downs in a market like hog farming?

Click Back. **Click** Menu and **B. Explore the Model.**

Look at the simplified representation of the system and click on the different parts.

a. What "story" does the diagram tell?

Click Tour the Model Structure and click through each of the parts. Use the space bar to see one piece added at a time.

b. Looking at the map of the system, fill in the following table.

Stock	What increases the stock?	What decreases the stock?	How does this stock affect another stock(s)?
Piglets			
Available pork			
Farmers expected price for hogs			

Debrief (continued)

Click Back**. Click** Tour the Loops. **Click** on the two B (Balancing) and one R (Reinforcing) symbols for the explanations.

c. Choose one of the loops, draw it here, and "tell the story" of that loop in your own words.

d. How does that loop relate to the behaviors you saw in the simulation?

Click Back**,** Menu and **C. Connections.** Read "A Familiar Story," then **click** Continue and read "Commodities are Everywhere."

a. List at least five examples of commodities that you use.

Commodity	My Use

Click Continue and read "Worldwide Impact."

b. List at least three issues that are a result of commodity price swings.

c. In your own words, what is a price index and how might it be useful?

Commodity Comparison (Use a separate piece of paper if needed)**:**

Aspect	Large Farms	Small Farms
Size of farm		
Price fluctuation and impact on the farmers		
Total pork supply (market share)		
Practicality in terms of feeding people		
Community benefits		
Community costs		
Environmental impact in terms of feed sources, topsoil, and waste products		
Treatment of animals		