



Choice:

ECONOMICS MATERIALS FOR
SUCCESS

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Costs of production – Will Florida continue to be synonymous with oranges?

Related news article: [Florida and oranges have been a pair for decades. Now the industry has sour prospects](#) (*The Guardian*, December 22, 2024)

Summary: This worksheet could be used for in-class or homework practice. Students will be asked to read the *excerpts* from a short article about the struggles of the markets for Florida-grown oranges and orange juice. Greening (that is, an untreatable tree disease) and hurricanes have reduced citrus production in Florida. As a result, the market for orange juice made in Florida has been negatively affected. In addition, many citrus farmers have struggled to keep up with the rising production costs and have chosen to exit the market and to sell their land for development.

Most of the questions the worksheet will ask students to answer focus on the different types of costs and firms' profits. Students will also be asked to discuss why the costs of production of various farms differ and the different ways citrus growers could respond to the rising costs of making oranges and orange juice. **Answers are provided at the end of this document.**

Learning objectives: At the end of this worksheet, students will be able to:

- o Distinguish between fixed costs (FC) and variable costs (VC) associated with the production of oranges;
- o Analyze the connection between the marginal cost of picking an extra box of oranges and (dis)economies of scale;
- o Interpret what cost curves show;
- o Calculate FC, VC and total cost (TC) of orange production given the average FC (AFC) and the average VC (AVC) at a given output level;
- o Understand what it means for a firm to be breaking even and what a break-even price is;
- o Apply the supply and demand model to explain why greening and hurricanes that have affected the market for oranges have also led to an increase in the price of orange juice made in Florida.

Economics concepts: Fixed cost, Variable cost, Cost of production, Average fixed cost, Average variable cost, Average total cost, Marginal cost, Economies of scale, Diseconomies of scale, Constant returns to scale, Cost curves, Supply and demand model, Profit, Total revenue

Suggested excerpts:



“... another hyperactive hurricane season, paired with the dogged persistence of an untreatable tree disease known as greening, has left a once-thriving citrus industry on life support.”

“Only 12m boxes of oranges will have been produced in Florida by the end of this year, US Department of Agriculture (USDA) forecasts show, the lowest single-year yield in almost a century. The figure is 33% lower than a year ago, and less than 5% of the 2004 harvest of 242m boxes. It is also dwarfed by the 378m boxes expected to be produced this year in Brazil, the world’s largest grower and exporter of oranges. Each box weighs 90lb (41kg) and contains an average 300 pieces of fruit depending on variety.”

“As a result, Florida-produced juice that used to be a staple of the breakfast table has become an expensive luxury for many families, and some growers who have struggled to keep up with rising production costs and ever-shrinking returns have sold their land for development and left the industry for good.”

“Greening has reduced citrus production in Florida by 75% during that time [in the last 20 years], the USDA says.”

“According to Florida Citrus Mutual, the state’s largest trade group representing 2,000 growers, about 70% of the most productive groves were ravaged by Hurricane Milton in October, just before harvesting.”

“Some of the growers, Simmons [a fifth-generation Floridian and citrus farmer] said, had simply had enough and sold their land for development.”

“Simmons, meanwhile, said he and several others who made up the Gulf coast group plan to stay in the business. “I don’t know if I’m stubborn or hard-headed, but I still have the land and I’m hanging in there. I don’t want to do anything else,” he said. “We tried peaches and we tried blueberries, we tried olives and a multitude of crops, but nothing grows in Florida like an orange tree.””



Student Questions

1. According to the article, what factors have challenged the citrus industry in Florida in 2024?

- Shortage of farmers and land, which are key inputs for citrus production.
- An untreatable tree disease and hurricanes.
- An increase in the opportunity cost of farming.
- Change in consumers' preferences.

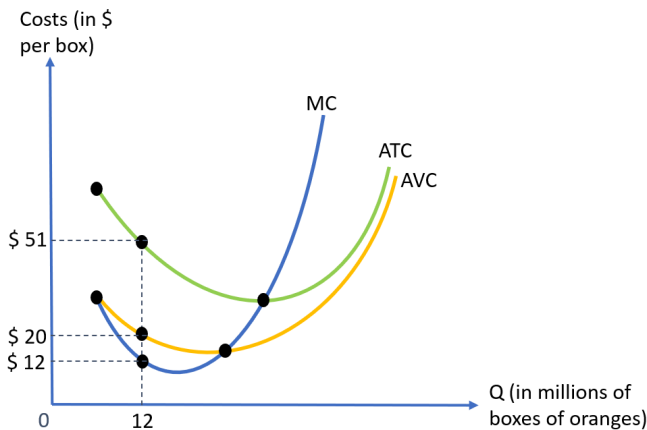
2. Below is a list of what citrus farmers have to pay for. Which of these costs are fixed (FC) and which are variable (VC)?

- Salaries of the team of farmers who harvest the oranges.
- Land.
- Resources such as water, electricity, and petrol for tractors.
- Orchard maintenance.
- Cardboard boxes to put the oranges in.
- Servers, websites and apps to sell the oranges (which have to be paid regardless of whether no, some or all oranges are sold).
- Shipping of oranges to households and stores.
- Interest on operating capital.

3. In your opinion, do all citrus farms have the same production costs? Explain.

4. Fill in the gaps. Once all trees are planted and there are oranges growing on them, if the marginal cost of picking each extra box of oranges is diminishing, the average cost (ATC) per box of picked oranges _____ (decreases/increases), implying _____ (economies of scale/diseconomies of scale/constant returns to scale).

The following graph shows the marginal cost (MC), average variable cost (AVC) and average total cost (ATC) curves for Florida-grown oranges. Use the graph to answer questions 5 and 6.



5. At an output level of 12 million boxes of oranges, how much is the variable cost (VC) of producing 12 million boxes of oranges?



6. At an output level of 12 million boxes of oranges, how much is the fixed cost (FC) of producing 12 million boxes of oranges?
7. The total cost of producing processed oranges grown in southwest Florida in 2023 was \$2,573.89 per acre¹. With yield at 100 boxes of oranges per acre, what was the break-even price of oranges? Explain and express your answer in dollars per box of oranges.
8. According to the article, what have the struggling citrus farmers in Florida done in response to the rising production costs of oranges? Specify at least two responses.
9. According to the article, which is the world's largest grower and exporter of oranges?
- Brazil.
 - Spain.
 - The United States.
 - Egypt.
10. The article explains that as a result of the struggles of the market for Florida-grown oranges, "Florida-produced juice that used to be a staple of the breakfast table has become an expensive luxury for many families." Use the supply and demand model to explain why greening and hurricanes that have affected orange production in Florida in 2024 have led to an increase in the price of orange juice made of Floridian oranges.

¹ https://crec.ifas.ufl.edu/media/crecifasufledu/economics/2022_23_SW-Costs_20231114.pdf



Answer Key

1. According to the article, what factors have challenged the citrus industry in Florida in 2024?

- Shortage of farmers and land, which are key inputs for citrus production.
- An untreatable tree disease and hurricanes.***
- An increase in the opportunity cost of farming.
- Change in consumers' preferences.

Answer: B. The article states that a “hyperactive hurricane season, paired with the dogged persistence of an untreatable tree disease known as greening, has left a once-thriving citrus industry on life support.”

2. Below is a list of what citrus farmers have to pay for. Which of these costs are fixed (FC) and which are variable (VC)?

- Salaries of the team of farmers who harvest the oranges.
- Land.
- Resources such as water, electricity, and petrol for tractors.
- Orchard maintenance.
- Cardboard boxes to put the oranges in.
- Servers, websites and apps to sell the oranges (which have to be paid regardless of whether no, some or all oranges are sold).
- Shipping of oranges to households and stores.
- Interest on operating capital.

Answer:

- Salaries of the team of farmers who harvest the oranges. – VC.**
- Land. – FC.**
- Resources such as water, electricity, and petrol for tractors. – VC.**
- Orchard maintenance. – FC.**
- Cardboard boxes to put the oranges in. – VC.**
- Servers, websites and apps to sell the oranges (which have to be paid regardless of whether no, some or all oranges are sold). – FC.**
- Shipping of oranges to households and stores. – VC.**
- Interest on operating capital. – FC.**

3. In your opinion, do all citrus farms have the same production costs? Explain.

Answer: No, different farmers have different production costs. Answers may vary, but students could explain that farms pay different salaries to the workers, use different packaging, websites, shipping methods, and so on. All of these differences contribute to differences in the production costs of various farms.

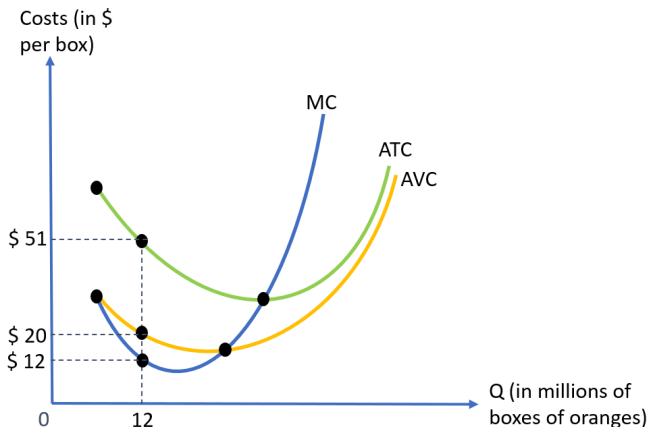
4. Fill in the gaps. Once all trees are planted and there are oranges growing on them, if the marginal cost of picking each extra box of oranges is diminishing, the average cost (ATC) per box of picked oranges _____ (decreases/increases), implying _____ (economies of scale/diseconomies of scale/constant returns to scale).

Answer: Diminishing MC implies economies of scale. Once all trees are planted and there are oranges growing on them, if the marginal cost of picking each extra box of



oranges is diminishing, the average cost (ATC) per box of picked oranges decreases, implying economies of scale.

The following graph shows the marginal cost (MC), average variable cost (AVC) and average total cost (ATC) curves for Florida-grown oranges. Use the graph to answer questions 5 and 6.



5. At an output level of 12 million boxes of oranges, how much is the variable cost (VC) of producing 12 million boxes of oranges?

Answer: At an output level of 12 million boxes of oranges, $AVC = \$20$ per box. $AVC = VC/Q$, so $VC = AVC \cdot Q = \$20 \cdot 12$ million = $\$240$ million.

6. At an output level of 12 million boxes of oranges, how much is the fixed cost (FC) of producing 12 million boxes of oranges?

Answer: $TC = FC + VC$, so $FC = TC - VC = ATC \cdot Q - \240 million = $\$51 \cdot 12$ million - $\$240$ million = $\$612$ million - $\$240$ million = $\$372$ million.

7. The total cost of producing processed oranges grown in southwest Florida in 2023 was \$2,573.89 per acre². With yield at 100 boxes of oranges per acre, what was the break-even price of oranges? Explain and express your answer in dollars per box of oranges.

Answer: The break-even price for covering the total costs of production is the price at which the (economic) profit is zero. The profit is zero when $TR = TC = \$2,573.89$ per acre, that is, when $P = ATC$. ATC is $TC/Q = \$2,573.89$ per acre/100 boxes per acre = $\$25.7389$ per box, or approximately $\$25.74$ per box of oranges.

8. According to the article, what have the struggling citrus farmers in Florida done in response to the rising production costs of oranges? Specify at least two responses.

Answer: Some farmers have exited the market and have sold their land for development. Others have tried to grow peaches, blueberries, olives, and other crops. Finally, some farmers have continued to grow oranges.

9. According to the article, which is the world's largest grower and exporter of oranges?

a. **Brazil.***

² https://crec.ifas.ufl.edu/media/crecifasufledu/economics/2022_23_SW-Costs_20231114.pdf



- b. Spain.
- c. The United States.
- d. Egypt.

Answer: A. The article mentions that Brazil is the largest grower and exporter of oranges in the world.

10. The article explains that as a result of the struggles of the market for Florida-grown oranges, “Florida-produced juice that used to be a staple of the breakfast table has become an expensive luxury for many families.” Use the supply and demand model to explain why greening and hurricanes that have affected orange production in Florida in 2024 have led to an increase in the price of orange juice made of Floridian oranges.

Answer: Greening and hurricanes have decreased the supply of oranges in Florida. Graphically, the supply curve for oranges has shifted to the left, leading to a lower equilibrium quantity and a higher equilibrium price of the good. Oranges are an input necessary to produce orange juice. As oranges have become more expensive, the cost of producing orange juice has increased, discouraging orange juice production. Therefore, the supply of orange juice made of Florida-grown oranges has decreased, that is, the supply curve for orange juice has shifted to the left, too. As a result, the equilibrium price of orange juice has increased. The effect is shown on the following graph:

