

SUSTAINABLE BIOECONOMY

— FOR ARID REGIONS —



EXCEL FOR AGRIBUSINESS: VARIABLE AND FIXED COSTS IN FARMING

OVERVIEW

This Excel video lesson focuses on variable and fixed costs in farming. In the lesson students complete case reports calculating variable costs, fixed costs, and total costs for a 50- and 100-acre farmland.

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Excel for Agribusiness: Variable and Fixed Costs in Farming

STUDENT LEARNING OBJECTIVES:

After completing this lesson, students will:

1. Understand the difference between variable and fixed costs in farming.
2. Understand the effects of fixed costs in total production costs.
3. Understand the effects of variable costs in total production costs.
4. Understand ways to use Excel for agribusiness.

TIME REQUIRED:

45 to 60 minutes

10 minutes teacher preparation

RESOURCES:

1. Excel for Agribusiness: Variable and Fixed Costs in Farming Lesson Plan
2. Excel for Agribusiness: Variable and Fixed Costs in Farming Video Lesson
https://youtu.be/t_ggllrA4c
3. Excel for Agribusiness Case Studies Workbook (Excel file)

EQUIPMENT AND SUPPLIES NEEDED:

1. Computer with Excel software
2. Device with access to YouTube Videos https://youtu.be/t_ggllrA4c
3. Copies of Variable and Fixed Costs Quiz (page 5) for all students
4. Copies of 50-Acre Case Report (Page 7) for all students
5. Copies of 100-Acre Case Report (page 9) for all students

THIS LESSON WOULD WORK WELL AS PART OF:

- Math curriculum
- Computer science curriculum
- Agribusiness curriculum
- Agriculture curriculum

THIS LESSON IS ALIGNED TO AFNR, FFA, COMMON CORE MATHEMATICS AND NGSS STANDARDS. Expanded standards listed on page 11.



LESSON PLAN

1. Learning about Variable and Fixed Costs in Farming (5 minutes)

Ask students:

- What are variable costs in business? (*Variable cost: costs that change based on the changed quantity of goods and services produced by the farm/company*)
- What are fixed costs in business? (*Fixed costs: cost that do not depend on the changed quantity of goods and services produced by the farm/company*)
- Can you relate both terms to crop production?

2. Watch Variable and Fixed Costs in Farming Video Lesson (9 minutes)

Students will watch Variable and Fixed Costs in Farming lesson video, stopping at 9:00. The video explains what variable and fixed costs are along with agricultural examples of each.

3. Complete Variable and Fixed Costs Quiz (5 minutes)

After students watch the video, they complete the Variable and Fixed Costs Quiz on page 5. Have students correct their quiz using the answers key on page 6. Review for understanding.

4. Complete 50-Acre Case Report (5 to 10 minutes)

Open Excel for Agribusiness Case Studies Workbook. Open the Case 4 worksheet with the 50-acre range cost table. Students need to fill in the blank cells with the appropriate formulas. Students will write their answers on the 50-Acre Case Report (page 7).

5. Complete 100-Acre Case Report (5 to 10 minutes)

Open Excel for Agribusiness Case Studies Workbook. Open the Case 4 worksheet with the 100-acre range cost table. Students need to fill in the blank cells with the appropriate formula. Students will write their answers on the 100-Acre Case Report (page 9).

6. Continue Video Lesson (8 minutes) from 9:16

Have students watch the video from 9:16 until the end. This section will review the procedures to complete the Variable and Fixed Costs in Farming Case Reports. Stop the video periodically to check for comprehension. The answer key for 50-acres is on page 8 and 100-acres on page 10.

7. Leveling Up Questions (3 to 5 minutes)

- Ask students how variable and fixed costs in Excel are part of a whole farm budget.

8. Exit Ticket Discussion (3 to 5 minutes)

- Ask students to discuss how fixed and variable costs help growers plan for future investments.



DEFINITIONS:

Excel for Agribusiness: Introduction (Video Lesson 1)

Acre: Unit of land area (66 feet by 660 feet).

Cell: The rectangular area located in the worksheet.

Cell Reference: Area that shows name of cell.

Crop Yield: Refers to the amount of agricultural (crop) production harvested.

Format: The top bar where we can modify number formats, align your numbers/content, or modify the font for text.

Formulas: A formula category that includes addition, subtraction, division, multiplication, SUM, and average.

lbs.: Abbreviation for pounds. This is the unit of mass used in yield to indicate amount of crop harvested.

Range: A group of selected cells/tables.

Table: A tool used to group data together in the Excel program.

Workbook: Excel program file.

Worksheet: Worksheet within the excel file.

Excel for Agribusiness: Charts (Video Lesson 2)

Charts: The term for graphical representation of data. Charts represent data as a symbolic alternative including bar, line, or pie charts.

Graph: A chart that specifically plots data along 2 dimensions.

Ribbon Tab: Upper nine tabs that contain File, Home, Insert, Page Layout, Formulas, Data, Review, View, and Help.

Inputs and Outputs in Crop Production (Video Lesson 3)

Firm: A business entity which operates on a for-profit basis.

Gross Sales: Overall revenue.

Inputs: Resources used to create goods and services.

Net Income: Total revenue minus total expenses.

Outputs: The quantity of goods or services produced in a specific amount of time.

Excel for Agribusiness: Variable and Fixed Costs in Farming (Video Lesson 4)

Variable Cost: Cost that varies with the level of production.

Fixed Cost: Cost that does not change when the production changes.

Total Cost: The total economic cost of the production (variable cost + fixed costs).



Variable and Fixed Costs Quiz

Name:

Directions: Answer each question

- _____

1. Name the type of cost that changes when you increase the production of goods?
 2. What is the formula for total cost?
 3. Which of the following are fixed costs?
 - a. Tractor
 - b. Chemicals
 - c. Seed
 - d. Land rent
 - e. a and d
 - f. c and d



Answer Key for Variable and Fixed Costs Quiz

1. Name the type of cost that changes when increasing the production of good?

Variable Cost

2. What is the formula for total cost?

Total Cost = Variable Cost + Fixed Costs

3. Which of the following are fixed costs?

e. a (tractor) and d (land rent)



50-Acre Case Report

Use: Excel for Agribusiness Case Studies Workbook

Name: _____

Directions: Complete the tables

1. Open Excel for Agribusiness Case Studies Workbook. Open the Case 4 worksheet, located in the workbook bottom left side. This report is 50-Acre Case Report.
2. This part of the lesson focuses on total production of 50-acre farm. Students will work on variable and fixed costs to find the total cost of production. Fill in the blank spaces in the 5 tables using the appropriate formulas (=SUM, +, -, etc.). Scroll to the left side of the worksheet to see formulas. Then insert your totals in the 50-Acres table below. Provide the variable, fixed, and total cost for the 50-acre farm and write down your final answers in the tables below.

| Formulas | |
|----------------|--------------|
| Addition | = # + # |
| Division | = # / # |
| Subtraction | = # - # |
| Multiplication | = # * # |
| Range Addition | =SUM (#1,#2) |
| Average | =AVERAGE |

| 50-Acres | |
|------------------|------------|
| Variable Cost | Per acre |
| Seed | \$1,000.00 |
| Land Preparation | \$400.00 |
| Chemicals | \$300.00 |
| Fertilizers | \$150.00 |
| Irrigation | \$100.00 |
| Hourly Labor | \$3,000.00 |
| Total | |

| Formula for Variable Cost | |
|--|--|
| VC = Cost Per Unit * Total Number of Units | |
| Total Variable Cost | |

| Fixed Cost | Cost |
|--------------|-------------|
| Tractor | \$50,000.00 |
| Land Rent | \$13,900.00 |
| Salary Labor | \$20,000.00 |
| Total | |

| Formula for Total Cost | |
|-----------------------------------|--|
| TC = Variable Costs + Fixed Costs | |
| 50-Acre Total Cost | |

| Formula for Fixed Cost | |
|--|--|
| Total Cost of Production – (Variable Cost Per Unit * Number of Units Produced) | |
| Total Fixed Cost | |



Answer Key: 50-Acre Case Report (Case 4)

| 50-Acres | |
|--|---------------|
| Variable Cost | Per acre |
| Seed | 1000 |
| Land Preparation | 400 |
| Chemicals | 300 |
| Fertilizers | 150 |
| Irrigation | 100 |
| Hourly Labor | 3000 |
| Total | =SUM(E4:E9) |
| Formula for Variable Cost | |
| VC = Cost Per Unit * Total Number of Units | |
| Total Variable Cost | =E10*50 |
| Fixed Cost | |
| Tractor | 50000 |
| Land Rent | 13900 |
| Salary Labor | 20000 |
| Total | =SUM(E17:E19) |
| Formula for Total Cost | |
| TC = Variable Costs + Fixed Costs | |
| 50-Acre Total Cost | =E14+E20 |

| 50-Acres | |
|--|--------------|
| Variable Cost | Per acre |
| Seed | \$1,000.00 |
| Land Preparation | \$400.00 |
| Chemicals | \$300.00 |
| Fertilizers | \$150.00 |
| Irrigation | \$100.00 |
| Hourly Labor | \$3,000.00 |
| Total | \$4,950.00 |
| Formula for Variable Cost | |
| VC = Cost Per Unit * Total Number of Units | |
| Total Variable Cost | \$247,500.00 |
| Fixed Cost | |
| Tractor | \$50,000.00 |
| Land Rent | \$13,900.00 |
| Salary Labor | \$20,000.00 |
| Total | \$83,900.00 |
| Formula for Total Cost | |
| TC = Variable Costs + Fixed Costs | |
| 50-Acre Total Cost | \$331,400.00 |

| Formula for Fixed Cost | |
|--|----------|
| Total Cost of Production – (Variable Cost Per Unit * Number of Units Produced) | |
| Total Fixed Cost | =E24-E14 |

| Formula for Fixed Cost | |
|--|-------------|
| Total Cost of Production – (Variable Cost Per Unit * Number of Units Produced) | |
| Total Fixed Cost | \$83,900.00 |



100-Acre Case Report

Use: Excel for Agribusiness Case Studies
Workbook

Name: _____

Directions: Complete the tables

1. Open Excel for Agribusiness Case Studies Workbook. Open the Case 4 worksheet, located in the workbook bottom left side. This report is 100-Acre Case Report.
2. This part of the lesson focuses on total production of 100-acre farm. Fill in the blank spaces in the 5 tables using the appropriate formulas (=SUM, +, -, etc.). Scroll to the left side of the worksheet to see formulas. Then insert your totals in the 100-Acres table below. Provide the variable, fixed, and total cost for the 100-acre farm and write down your final answers in the tables below. Once both 50 and 100-acre tables are filled in, discuss on the right side of the page how variable and fixed costs differ from each table's total cost.

| Formulas | |
|----------------|--------------|
| Addition | = # + # |
| Division | = # / # |
| Subtraction | = # - # |
| Multiplication | = # * # |
| Range Addition | =SUM (#1,#2) |
| Average | =AVERAGE |

| 100-Acres | |
|------------------|------------|
| Variable Cost | Per acre |
| Seed | \$1,000.00 |
| Land Preparation | \$400.00 |
| Chemicals | \$300.00 |
| Fertilizers | \$150.00 |
| Irrigation | \$100.00 |
| Hourly Labor | \$3,000.00 |
| Total | |

| Formula for Variable Cost | |
|--|--|
| VC = Cost Per Unit * Total Number of Units | |
| Total Variable Cost | |

| Fixed Cost | Cost |
|--------------|-------------|
| Tractor | \$50,000.00 |
| Land Rent | \$13,900.00 |
| Salary Labor | \$20,000.00 |
| Total | |

| Formula for Total Cost | |
|-----------------------------------|--|
| TC = Variable Costs + Fixed Costs | |
| 50-Acre Total Cost | |

| Formula for Fixed Cost | |
|--|--|
| Total Cost of Production – (Variable Cost Per Unit * Number of Units Produced) | |
| Total Fixed Cost | |

Discussion: _____



ANSWER KEY: 100-Acre Case Report (Case 4)

| 100-Acres | |
|----------------------|--------------------|
| Variable Cost | Per acre |
| Seed | 1000 |
| Land Preparation | 400 |
| Chemicals | 300 |
| Fertilizers | 150 |
| Irrigation | 100 |
| Hourly Labor | 3000 |
| Total | =SUM(J4:J9) |

| Formula for Variable Cost | |
|--|-----------------|
| VC = Cost Per Unit * Total Number of Units | |
| Total Variable Cost | =J10*100 |

| Fixed Cost | Cost |
|-------------------|----------------------|
| Tractor | 50000 |
| Land Rent | 13900 |
| Salary Labor | 20000 |
| Total | =SUM(J17:J19) |

| Formula for Total Cost | |
|-----------------------------------|-----------------|
| TC = Variable Costs + Fixed Costs | |
| 100-Acre Total Cost | =J20+J14 |

| 100-Acres | |
|----------------------|-------------------|
| Variable Cost | Per acre |
| Seed | \$1,000.00 |
| Land Preparation | \$400.00 |
| Chemicals | \$300.00 |
| Fertilizers | \$150.00 |
| Irrigation | \$100.00 |
| Hourly Labor | \$3,000.00 |
| Total | \$4,950.00 |

| Formula for Variable Cost | |
|--|---------------------|
| VC = Cost Per Unit * Total Number of Units | |
| Total Variable Cost | \$495,000.00 |

| Fixed Cost | Cost |
|-------------------|--------------------|
| Tractor | \$50,000.00 |
| Land Rent | \$13,900.00 |
| Salary Labor | \$20,000.00 |
| Total | \$83,900.00 |

| Formula for Total Cost | |
|-----------------------------------|---------------------|
| TC = Variable Costs + Fixed Costs | |
| 100-Acre Total Cost | \$578,900.00 |

| Formula for Fixed Cost | |
|--|-----------------|
| Total Cost of Production – (Variable Cost Per Unit * Number of Units Produced) | |
| Total Fixed Cost | =J24-J14 |

| Formula for Fixed Cost | |
|--|--------------------|
| Total Cost of Production – (Variable Cost Per Unit * Number of Units Produced) | |
| Total Fixed Cost | \$83,900.00 |



STANDARDS DETAILS (AFNR, FFA, COMMON CORE MATHEMATICS, NGSS)

AFNR Career Ready Practices

CRP.02: Apply appropriate academic and technical skills. Career-ready individuals readily access and use the knowledge and skills acquired through experience and education to be more productive.

CRP.02.01. Use strategic thinking to connect and apply academic learning, knowledge and skills to solve problems in the workplace and community.

CRP.02.02. Use strategic thinking to connect and apply technical concepts to solve problems in the workplace and community.

CRP.03.02 Design and implement a personal financial management plan.

CRP.04: Communicate clearly, effectively, and with reason. Career-ready individuals communicate thoughts, ideas and action plans with clarity, whether using written, verbal and/or visual methods.

CRP.07: Employ valid and reliable research strategies. Career-ready individuals are discerning in accepting and using new information to make decisions, change practices or inform strategies.

CRP.08: Utilize critical thinking to make sense of problems and persevere in solving them.

CRP.11. Use technology to enhance productivity

AFNR Agribusiness Systems Career Pathway

ABS.02. Use record keeping to accomplish AFNR business objectives, manage budgets and comply with laws and regulations.

ABS.02.01.02.c. Recommend and select tools and services to track, record and audit AFNR business transactions that meet business needs and priorities (e.g., electronic and paper based systems, etc.).

FFA Precept

FFA.PL-A. Action: Assume responsibility and take the necessary steps to achieve the desired results, no matter what the goal or task at hand.

FFA.PL-E. Awareness: Understand personal vision, mission and goals.

FFA.PL-F. Continuous Improvement: Accept responsibility for learning and personal growth.

FFA.PG-J. Mental Growth: Embrace cognitive and intellectual development relative to reasoning, thinking, and coping.

FFA.CS-M. Communication: Effectively interact with others in personal and professional settings.

FFA.CS-N. Decision Making: Analyze a situation and execute an appropriate course of action.

FFA.CS-O. Flexibility/Adaptability: Be flexible in various situations and adapt to change.

Common Core Mathematics with NGSS connections

Middle School:

MP.4: Model with mathematics (NGSS MS-LS2-5)

6.RP.A.3 Use ratio and rate reasoning to solve real-world and mathematical problems. (NGSS MS-LS2-5)

6.SP.B.5 Summarize numerical data sets in relation to their context. (NGSS MS-LS2-2)

7.EE.B.3 Solve real-life and mathematical problems using numerical and algebraic expressions and equations. (NGSS MS-LS2-5)

High School:

MP.2 Reason abstractly and quantitatively. (HS-ESS3-1),(HS-ESS3-2),(HS-ESS3-3),(HS-ESS3-4),(HS-ESS3-6)

MP.4 Model with mathematics. (HS-ESS3-3),(HS-ESS3-6)



HSN.Q.A.1 Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas; choose and interpret the scale and the origin in graphs and data displays. (HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-6)

HSN.Q.A.3 Choose a level of accuracy appropriate to limitations on measurement when reporting quantities. (HS-ESS3-1),(HS-ESS3-4),(HS-ESS3-6)

NGSS

HS-ETS1-4. Use a computer simulation to model the impact of proposed solutions to a complex real-world problem with numerous criteria and constraints on interactions within and between systems relevant to the problem.

HS-ESS3-2. Evaluate competing design solutions for developing, managing, and utilizing energy and mineral resources based on cost-benefit ratios.



AUTHOR BIOGRAPHY

Luis Enrique Ramos-Coronado is an International Graduate student at New Mexico State University. Currently, he is doing a Master's in Agriculture with specialization in Agribusiness through the Department of Agricultural Economics and Agricultural Business (AEAB). Luis earned his B.S. degree in Agronomy at New Mexico State University. He is from Guanajuato, an important agricultural state in Mexico. His plan is to learn and acquire experience focused on sectors like crop production and agribusiness, and someday apply his knowledge in Guanajuato, Mexico.

ACKNOWLEDGMENTS

I would like to extend my deepest gratitude to Dr. Frannie Miller from the Department of Agricultural Economics and Agricultural Business at New Mexico State University, and Jacqueline Bruhn, Program Coordinator for SBAR for their advice, suggestions, guidance, support, and for sharing their own field experience for the development of this activity.