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## Agriscience and Biotech 4: Agricultural Solutions

### Unit 7: Agricultural Microeconomics

#### Lesson 6: Cost / Benefit Analysis

#### For Teachers

**Grade Level:** 12

**Brief Introduction:** In this lesson, students will analyze the costs and benefits of installing a solar panel array at Piedmont Farm.

**Creator(s)**

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*Jen Weiss is a Senior Environmental Finance Analyst at the EFC, focused on financial models and mechanisms that can be used by universities, non-profits, and other public organizations to encourage the implementation of renewable energy and energy efficiency projects. Jen holds a Master of Environmental Management degree from Duke University, an MBA from the University of Michigan, and an undergraduate degree in Economics from the University of California in San Diego.*

**Precedents**

Students must have completed Lessons 1-5 in the 12<sup>th</sup> grade Agricultural Microeconomics Unit 7. In addition, is recommended that students have completed Units 1 – 6 of the 12<sup>th</sup> grade Agriscience and Biotechnology strand. For this lesson, students must have a basic working knowledge of spreadsheet software basics.

**Brief Summary:** In this lesson, students will use information about a new innovation for Piedmont Farm – the installation of 25 solar panels on the farm’s land. The students will learn how to analyze the costs of the solar installation and the accompanying benefits. Finally, the students will make a recommendation about whether the farm should move forward with the investment.

**Keywords (Metadata):**

Agriculture | Economics | Solar PV | Financing | Capital Expenditure | Cost | Benefit | Renewable Energy

**Learning Outcomes**

1. Understand the concept of costs and benefits.
2. Use an Excel spreadsheet to prepare a cost – benefit analysis for Piedmont Farm.
3. Analyze the outcome of the analysis and make a recommendation for investment.

**Class Time Required**

1x 90-minute class period



### Materials Needed (if not indicated in lesson documents)

Copies of the following for the teacher:

1. Cost – Benefit Analysis Teacher Notes (ppt)
2. Solar on Piedmont Farm (.docx)
3. Teacher Solution - Piedmont Farm Cost-Benefit Worksheet (.docx)

Copies of the following handouts for students:

1. Solar on Piedmont Farm (.docx)
2. Piedmont Farm Cost - Benefit Worksheet (.xls)
3. Piedmont Farm case study (.docx)

LCD Projector

Computers/Laptops for Students

### Computer Software and Technology Needed

Internet, word processing, spreadsheet software

### Teacher Instructions for Conducting Lesson

#### Part 1 (30 minutes):

Begin by introducing the concept of a cost-benefit analysis and how it might be used to help a farmer make an important investment decision.

**PowerPoint Slide Instructions:** Print out Cost-Benefit Analysis Teacher Notes. *The information for each slide can be found in the “notes” section.*

*Goal for Part 1: Complete slide 2-3 to introduce concepts. Distribute the “Solar on Piedmont Farm” mini case study and ask the students to take 10 minutes to read through it. The information provided in this mini case study will be used for the next part of the lesson. After the students have read the mini-case, bring them back as a group and answer any questions. Make sure they understand how to calculate the amount of energy (revenue) that can be produced (slides 4-5) and identify the different types of costs (slide 6).*

**Part 2 (30 minutes):** In this part of the class, the students will use the information found in the Piedmont Farm Solar Panel mini case study to do their own Cost-Benefit Analysis. They will need a computer to do this work and use the spreadsheet found in the “Piedmont Farm Cost-Benefit Analysis Worksheet.” This is an excel file and the input values will be blank when the students open it. Depending on the number of computers in class, divide the students into groups (or individually) so that each student has a computer to work on. Ask the students to open the worksheet and use the information in the case study to input the costs and benefits into the GREEN input boxes. Please note that the worksheet will automatically calculate certain numbers for the students, so the only numbers that need to be input are the GREEN INPUT numbers. Give the students 20-30 minutes to work through the spreadsheet and enter the numbers. Once they have entered the information, they should review the actual cost-benefit analysis (found in the second part of the spreadsheet) and be ready to discuss with the class

**PowerPoint Slide Instructions:** Print out Cost-Benefit Analysis Teacher Notes. *The information for each slide can be found in the “notes” section.*

*Goal for Part 2: Complete slide 7 to give students instructions on how to complete the excel worksheet.*



**Part 3 (30 minutes):**

Use the Teacher Solution and the discussion questions to guide the students through a review of the cost-benefit analysis that they just prepared. If the numbers were entered correctly, the result should be the same. Ask the students to think about other costs or benefits that might be associated with other types of projects. This will be important when they start to think about their Capstone project.

If time allows, the students can input different scenarios and see how the results change. For example, what happens if the amount of the loan increases to \$50,000? What happens if the Purchased Power Agreement provides the Farm with only \$0.06 per kilowatt-hour? What happens if the Farm only invests in a smaller project (10 kilowatt instead of 25 kilowatt)?

**PowerPoint Slide Instructions:** Print out Cost-Benefit Analysis Teacher Notes. *The information for each slide can be found in the “notes” section.*

*Goal for Part 3: Complete slides 8-9 to discuss the results of the Cost-Benefit Analysis using the discussion questions found on the slides. Complete slide 10 if time allows.*

**Additional resources for teachers and students**

National Renewable Energy Laboratory (NREL), Photovoltaics for Farms and Ranches, [http://www.nrel.gov/learning/fr\\_photovoltaics.html](http://www.nrel.gov/learning/fr_photovoltaics.html).

USDA Rural Energy for American Program (REAP), [http://www.rurdev.usda.gov/BCP\\_Reap.html](http://www.rurdev.usda.gov/BCP_Reap.html)

“Farm to Fork: A Direct-to-the-Consumer Beef Marketing Handbook,” by Annette Dunlap, Geoffrey Benson, and Matt Poore, Agricultural Marketing Resource Center, October 2008. [www.ncsu.edu/fvsi/beefhandbook/docs/NCSU-BeefHandbook-0510.pdf](http://www.ncsu.edu/fvsi/beefhandbook/docs/NCSU-BeefHandbook-0510.pdf)

“From Farm to Fork: A Guide to Building North Carolina’s Sustainable Local Food Economy,” Jennifer Curtis, et. al., Center for Environmental Farming Systems, April 2010. <http://www.cefs.ncsu.edu/resources/stateactionguide2010.pdf>

**Original version (if legally derived from somewhere else)**

Portions of the Piedmont Farm case study are adapted from the background and history of Ranney Ranch.

Portions of the materials are adapted from “Farm to Fork: Direct-to-the-Consumer Best Marketing Handbook,” By Annette Dunlap, Geoffrey Benson, and Matt Poore, Agricultural Marketing Resource Center, October 2008.

