

Lesson D4–2

Understanding Depreciation, Fixed, and Variable Costs

Unit D. Basic Agribusiness Principles and Skills

Problem Area 4. Applying Basic Economic Principles in Agribusiness

Lesson 2. Understanding Depreciation, Fixed, and Variable Costs

New Mexico Content Standard:

Pathway Strand: Agribusiness Systems

Standard: IV: Employ AFNR industry concepts and practices to manage inventory.

Benchmark: IV-A: Monitor inventory levels to accomplish practical inventory control.

Performance Standard: 1. Maintain optimum inventory levels. 2. Apply just-in-time concept. 3. Calculate cost of carrying inventory. 4. Perform logistics management.

Student Learning Objectives. Instruction in this lesson should result in students achieving the following objectives:

1. Distinguish between fixed and variable costs.
2. Calculate depreciation using the straight-line method.
3. Calculate depreciation using the sum-of-the-digits method.
4. Calculate depreciation using the double-declining method.

List of Resources. The following resources may be useful in teaching this lesson:

Recommended Resources. One of the following resources should be selected to accompany the lesson:

Agricultural Business Management Principles that Affect Production (VAS 2040a).
Vocational Agriculture Service, University of Illinois, Urbana, IL.

Little, Randall. *Economics: Applications to Agriculture and Agribusiness*. Danville, Illinois: Interstate Publishers, Inc., 1997. (Textbook, Chapter 28)

List of Equipment, Tools, Supplies, and Facilities

Writing surface
Overhead projector
Transparencies from attached masters
Copies of student lab sheets

Terms. The following terms are presented in this lesson (shown in bold italics):

Average fixed cost
Average total cost
Average variable cost
Break-even quantity
Depreciation
Double-declining method
Fixed costs
Marginal cost
Straight-line method
Sum-of-the-digits method
Total cost
Variable costs

Interest Approach. Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

Ask the students how they decide if a new enterprise for their SAEP is feasible.

Ask them why a new vehicle goes down by thousands of dollars in value as soon as it leaves the lot.

Relate the objectives of this lesson to the students.

Summary of Content and Teaching Strategies

Objective 1: Distinguish between fixed and variable costs.

Anticipated Problem: What is the difference between fixed and variable costs?

- I. A business has numerous production expenditures that are called costs.
 - A. **Fixed costs** are those costs that are constant regardless of level of production.
 1. Examples of fixed costs include depreciation, interest, and taxes.
 2. Fixed costs per unit of production decreases as more product is produced.
 - B. **Variable costs** are those costs that change as production levels change.
 1. Examples of variable costs include fertilizer, seed, feed, fuel, and hired labor.
 2. Total variable costs increase as production increases.
 - C. **Total cost** is variable costs plus fixed costs. Total cost increases as variable costs increase.
 - D. **Average variable cost** is figured by dividing total variable costs by total output at any given point.
 - E. **Average fixed cost** equals total fixed costs divided by total output at any given point.
 - F. **Average total cost** equals total cost divided by total output at any given point.
 - G. **Marginal cost** equals change in the total cost divided by the change in output. It is the cost of producing one additional unit of product.
 - H. The level of production that maximizes profits is where marginal costs equal the price received for the product.
 - I. **Break-even quantity** equals the total fixed costs divided by the price per unit minus the direct costs per unit.

Assign students to read Agricultural Business Management Principles that Affect Production (VAS 2040a) Section 3. Use TM: D4–2A to discuss the difference between fixed and variable costs. Use TM: D4–2B to discuss analyzing costs. Assign LS: D4–2A, Looking at Costs.

Objective 2: Calculate depreciation using the straight-line method.

Anticipated Problem: How is depreciation figured using the straight-line method?

- II. **Depreciation** is the decline in value of an asset due to use and age.
 - A. The **straight-line method** provides equal depreciation during each year of the asset's useful life.
 - B. This method is the easiest and probably most widely used.
 - C. The formula for determining straight-line depreciation is:
$$\frac{OC - SV}{n}$$

OC = original cost of the asset

SV = salvage value

n = useful life in years

- D. An example: A new air seeder for a commercial greenhouse with a cost of \$10,000 to be used for 10 years, with a salvage value of \$1,000 would depreciate \$900 per year.

Assign Economics: Applications to Agriculture and Agribusiness, pages 472–474. Use TM: D4–2C to discuss depreciation.

Objective 3: Calculate depreciation using the sum-of-the-digits method.

Anticipated Problem: How is depreciation figured using the sum-of-the-digits method?

- III. The **sum-of-the-digits method** is a way of calculating depreciation in which the rate of annual depreciation declines as an asset becomes older.

- A. The formula for determining depreciation using the sum-of-the-digits method is

$$\frac{n}{\text{Sum of the year's digits}} (\text{OC} - \text{SV})$$

n = useful life remaining

OC = original cost

SV = salvage value

- B. An example: A new air seeder for a commercial greenhouse with a cost of \$10,000 to be used for 10 years, with a salvage value of \$1,000 would depreciate \$1,636.20 the first year. This is figured as follows:

$$\frac{10}{(10 + 9 + 8 + 7 + 6 + 5 + 4 + 3 + 2 + 1)} (10,000 - 1,000) = \$1,636.20$$

Use Economics: Applications to Agriculture and Agribusiness, pages 472–474 as a reference for this objective. Use TM: D4–2C to discuss depreciation.

Objective 4: Calculate depreciation using the double-declining method.

Anticipated Problem: How is depreciation figured using the double-declining method?

IV. The **double-declining method** allows for fastest depreciation with a declining amount of depreciation each year.

A. The formula for determining depreciation using the double-declining method is

$$\frac{2}{N} R$$

N = useful life

R = remaining book value at the beginning of the year.

B. Salvage value is disregarded.

C. An example: A new air seeder for a commercial greenhouse with a cost of \$10,000 to be used for 10 years, with a salvage value of \$1,000 would depreciate \$2,000 the first year. This is figured as follows.

$$\frac{2}{10} 10,000 = \$2,000$$

Use *Economics: Applications to Agriculture and Agribusiness*, pages 472–474 as a reference for this objective. Use TM: D4–2C to discuss depreciation. Assign LS: D4–2B—Figuring Depreciation.

Review/Summary. Focus the review and summary of the lesson around the student learning objectives. Call on students to explain the content associated with each objective.

Application. Application can involve one or more of the following student activities using attached lab sheets:

LS: D4–2A – Looking at Costs

LS: D4–2B – Figuring Depreciation

Evaluation. Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is attached.

Answers to Sample Test:

Part One: Matching

1 = d, 2 = b, 3 = j, 4 = g, 5 = a, 6 = e, 7 = c, 8 = i, 9 = h, 10 = f

Part Two: Completion

- 1 = fixed
- 2 = increases
- 3 = equal
- 4 = age, use
- 5 = salvage value
- 6 = double declining

Part Three: Short Answer

1. $\$23,714.29 = \$40,000 - \$2,000 \div 7 = \$5,428.57. \$5,428.57 \times 3 \text{ years} = \$16,285.71.$
 $\$40,000 - \$16,285.71 = \$23,714.29$

Test

**Lesson D4–2: Understanding Depreciation, Fixed,
and Variable Costs****Part One: Matching**

Instructions. Match the term with the correct response. Write the letter of the term by the definition.

- | | |
|-----------------------------|----------------------------|
| a. sum-of-the-digits method | f. marginal cost |
| b. depreciation | g. double declining method |
| c. variable cost | h. break-even quantity |
| d. fixed cost | i. straight-line method |
| e. average fixed cost | j. average variable cost |

- _____ 1. Constant regardless of level of production.
_____ 2. Decline in value of asset due to age and use.
_____ 3. Total variable cost divided by total output.
_____ 4. Fastest method of depreciation.
_____ 5. Rate of annual depreciation decreases as an asset becomes older.
_____ 6. Total fixed cost divided by total output.
_____ 7. Changes as level of production changes.
_____ 8. Equal depreciation each year.
_____ 9. Level of production where fixed cost is covered.
_____ 10. Change in total cost divided by change in output.

Part Two: Completion

Instructions. Provide the word or words to complete the following statements.

1. Depreciation is an example of a _____ cost.
 2. Total cost _____ as variable costs increase.
 3. Maximum profit is realized when marginal costs are _____ to the marginal price received.
 4. Depreciation is the loss of value of an item due to _____ or _____.
 5. _____ is the expected value of an item after its useful life.
-

6. The _____ method disregards salvage value.

Part Three: Short Answer

Instructions. Provide information to answer the following questions.

1. What is the value of a \$40,000 greenhouse with a useful life of 7 years and a salvage value of \$2,000 at the end of the third year? Use the straight-line method.

Fixed Cost vs. Variable Cost

Fixed costs—costs that are constant regardless of level of production.

Examples of Fixed Costs

- Depreciation
- Interest
- Taxes

Variable costs—costs that change as production changes.

Examples of Variable Costs

- Fertilizer
- Seed
- Feed
- Fuel
- Hired labor

Analyzing Costs

Total cost = variable costs plus fixed costs.

Average variable cost = total variable costs ÷ total output at any given point.

Average fixed cost = total fixed costs ÷ total output at any given point.

Average total cost = total cost ÷ total output at any given point.

Marginal cost = change in total cost ÷ change in output.

Break-even quantity = total fixed costs ÷ (price per unit – direct costs per unit).

Depreciation

Depreciation—decline in value of an asset due to use and age.

Methods to Determine Depreciation

- Straight-line method—equal depreciation during each year of the asset's useful life.
- Formula = $\frac{OC - SV}{n}$

Sum-of-the-digits method—rate of annual depreciation declines as an asset becomes older.

- Formula = $\frac{n}{\sum \text{ of the years' digits}} (OC - SV)$

Double-declining method—fastest depreciation, a declining amount of depreciation each year.

- Formula = $\frac{2}{N} R$

OC = original cost of the asset

SV = salvage value

n or N = useful life

Lab Sheet

Looking at Costs

Purpose:

1. To investigate fixed and variable costs.

Procedure:

1. Use the information to answer the questions that follow.

A greenhouse operator is trying to decide if it is feasible to build an addition to the greenhouse. She is considering an addition that would allow her to produce 25,000 more plants. Average selling price per plant is \$2.00.

The cost to build the new structure is \$30,000. She will be making monthly payments of \$350 to pay for the building. Monthly utility bills will cost \$50 per 2,000 plants. The cost of pots, growing medium and fertilizer per plant is 5 cents. The fixed costs are as follows:

Depreciation	\$5,000
Insurance	800
Repairs	300
Taxes	400
Interest	700

As the greenhouse operator's accountant, you are to advise her about this idea.

1. What is the fixed cost per plant?
2. What is the variable cost per plant?
3. What is the total cost per plant?
4. Should the greenhouse operator build the new addition?

Lab Sheet Key

Looking at Costs

Answers:

1. $\$7,200 \div 25,000 \text{ plants} = \0.29

2. Utilities: $25,000 \text{ plants} \div 2,000 \text{ plants} = 12.5 \times \$50 \times 12 \text{ months} = \$7,500$
Pots, media, and fertilizers: $25,000 \text{ plants} \div \$0.05 = \$1,250$
Variable cost = $\$7,500 + 1,250 \div 25,000 = \0.35

3. $\$0.29 + \$0.35 = \$0.64$

4. Yes, profit of $\$2.00 - \$0.64 = \$1.36/\text{plant}$

Lab Sheet

Figuring Depreciation

Purpose:

1. Allow students to figure depreciation.

Procedure:

1. Use the information to answer the questions that follow.

You purchased a work truck for \$25,000. It will have a salvage value of \$7,500, after a useful life of 5 years.

- A. What will the remaining value be at the end of the first year using:

Straight-line method _____

Double-declining method _____

Sum-of-the-years method _____

- B. What will the remaining value be at the end of the second year using:

Straight-line method _____

Double-declining method _____

Sum-of-the-years method _____

Lab Sheet Key

Figuring Depreciation

Answers:

A. Straight-line method \$21,500

Double-declining method \$15,000

Sum-of-the-years method \$17,045

B. Straight-line method \$18,000

Double-declining method \$9,000

Sum-of-the-years method \$10,681