

# Unit D: **Applying Basic Economic Principles in Agribusiness**

Lesson 4: Utilizing Economic Principles to Determine How Much to Produce

# Terms

- Law of Diminishing Returns
- Marginal Cost
- Marginal Revenue

# Law of Diminishing Returns

- I. The Law of Diminishing Returns affects physical output and economic returns.
  - A. The ***law of diminishing returns*** states that as a variable resource is added to fixed resources, marginal output declines immediately or after an initial stage of increasing marginal returns. Total output may increase at an increasing rate for a time, but then increases at a decreasing rate until it reaches its maximum.
    - 1. One example that illustrates this principle particularly well is a vegetable enterprise. With the addition of more water, the vegetable plants will produce more high quality vegetables. However, with even more water added, the plants will begin to die because they have too much water.

# Law of Diminishing Returns

- B. Values need to be provided to understand the law of diminishing economic returns.
1. **Marginal cost** is the extra cost of producing one more unit of output.
    - a. Marginal cost is calculated by dividing the change in cost by the change in output.
    - b.  $MC = \Delta C / \Delta O$  Where  $\Delta$  is change, C is cost, and O is output.

# Law of Diminishing Returns

2. ***Marginal revenue*** is the extra revenue from producing and selling one more unit of output.
  - a. Marginal revenue is calculated by dividing the change in revenue by the change in output.
  - b.  $MR = \Delta R / \Delta O$  Where  $\Delta$  is change, R is revenue, and O is output

# Law of Diminishing Returns

3. Net returns will be highest when marginal cost is equal to marginal return.
  - a. The amount that should be produced is the where marginal cost equals marginal revenue or where marginal cost is just less than marginal revenue.
  - b.  $MC \leq MR$  (Marginal Cost is less than or equal to Marginal Revenue)

# Factors that Affect Profit

- II. Some speculation may need to be used when calculating marginal cost and marginal revenue. However, a business owner that has much experience with an enterprise will be better able to predict costs, revenues, and other factors based upon his knowledge and past enterprise records.
  - A. Some factors that affect the profit of an agribusiness can be controlled by the business owner. The business owner should be aware of these factors.

# Factors that Affect Profit

1. Price can be controlled if the agribusiness sells its products directly to consumers. The price should be set high enough to earn a profit, but not so high that consumers will not want to purchase the product.
2. Care for the commodity can be controlled.
  - a. Crops should be checked often for pests and steps should be taken to control pests if any are found.
  - b. Animals need have proper feed or pasture and water. Animals should also be carefully watched for sickness. If an animal becomes sick, special attention or medication may be needed to bring the animal back to its proper state of health.



# Factors that Affect Profit

3. The time that crops or animal products are harvested can be controlled.
  - a. Crops should be harvested at the proper maturity. If crops are left in the field beyond maturity, pests may invade and decrease the amount of commodity to be harvested.
  - b. Animal products should be collected or harvested at the proper time. Eggs should be collected shortly after they are laid to avoid them being broken. Goats and cows should be milk on a regular basis one to three times per day.

# Factors that Affect Profit

- B. Some factors that affect the profit of an agribusiness cannot be controlled.
1. Price cannot be controlled if the agribusiness sells its products to a broker. The broker offers a price to producers based upon supply and demand. The broker will also base the price he offers upon the costs of his business because he, too, needs to earn a profit.
  2. Weather and environmental conditions that are favorable will help the business owner have a bountiful harvest, while unfavorable weather conditions can ruin a crop.

# Determine the Most Profitable Level

III. When determining the how much to produce, steps should be taken to arrive at an accurate conclusion. In order to understand these steps more clearly, let's use a wheat enterprise as an example. Wheat price is \$0.60 per kilogram. Fertilizer price is \$0.45 per kilogram.

<u>Kg Fertilizer</u>	<u>Kg Wheat Yield</u>
30	679
33	684
36	687
39	689
42	690

# Determine the Most Profitable Level

## A. What is the input?

### 1. Fertilizer

- a. Several enterprises utilize more than one input. To calculate the most profitable level of production, use the input that is the most expensive.

## B. What is the output?

### 1. Wheat

## C. Question

### 1. How much

## D. Principle

### 1. $MC = MR$

# Determine the Most Profitable Level

## E. Equations

1.  $MC = \Delta C / \Delta O$

- a. To begin calculating marginal cost, the change, or difference, in cost must be found for each level of production. To do this, the cost at each level of input must be found. The difference is the input cost minus the input cost one level less.

### Example:

$$30 \times \$0.45 = \$13.50$$

$$33 \times \$0.45 = \$14.85$$

$$36 \times \$0.45 = \$16.20$$

$$39 \times \$0.45 = \$17.55$$

$$42 \times \$0.45 = \$18.90$$

$$\text{Change in Cost } \$14.85 - \$13.50 = \$1.35$$

$$\text{Change in Cost } \$16.20 - \$14.85 = \$1.35$$

$$\text{Change in Cost } \$17.55 - \$16.20 = \$1.35$$

$$\text{Change in Cost } \$18.90 - \$17.55 = \$1.35$$

## Determine the Most Profitable Level

b. To continue calculating marginal cost, the change, or difference, in output must be found for each level of production. To do this, subtract the next lowest level of output from the output.

Example:

679

684      Change in Output  $684 - 679 = 5$

687      Change in Output  $687 - 684 = 3$

689      Change in Output  $689 - 687 = 2$

690      Change in Output  $690 - 689 = 1$

## Determine the Most Profitable Level

c. To finish calculating marginal cost, the change in cost must be divided by the change in output.

Example:

$$MC = \$1.35 / 5 = \$.27$$

$$MC = \$1.35 / 3 = \$.45$$

$$MC = \$1.35 / 2 = \$.67$$

$$MC = \$1.35 / 1 = \$1.35$$

# Determine the Most Profitable Level

2.  $MR = \Delta R / \Delta O$

- a. To begin calculating marginal revenue, the change, or difference, in revenue must be found for each level of production. To do this, the revenue at each level of output must be found. The difference is the production revenue minus the production revenue one level less.

Example:

$$679 \times \$0.60 = \$407.40$$

$$684 \times \$0.60 = \$410.40 \quad \text{Change in Revenue } \$410.40 - \$407.40 = 3$$

$$687 \times \$0.60 = \$412.20 \quad \text{Change in Revenue } \$412.20 - \$410.40 = 1.80$$

$$689 \times \$0.60 = \$413.40 \quad \text{Change in Revenue } \$413.40 - \$412.20 = 1.20$$

$$690 \times \$0.60 = \$414.00 \quad \text{Change in Revenue } \$414.00 - \$413.40 = .60$$



## Determine the Most Profitable Level

- b. To continue calculating marginal revenue, use the change in output calculations from marginal cost.

Example:

679

684      Change in Output  $684 - 679 = 5$

687      Change in Output  $687 - 684 = 3$

689      Change in Output  $689 - 687 = 2$

690      Change in Output  $690 - 689 = 1$

## Determine the Most Profitable Level

- c. To finish calculating marginal revenue, the change in revenue must be divided by the change in output.

Example:

$$3 / 5 = .60$$

$$1.80 / 3 = .60$$

$$1.20 / 2 = .60$$

$$.60 / 1 = .60$$

## Determine the Most Profitable Level

- d. If the price is equal at each level of production, that will be the marginal revenue. However, if the price changes with more or less production, than the marginal revenue must be calculated.
  - i. For this example problem, we could have realized that \$.60 would be the marginal revenue, but we calculated it just to show the process.

# Determine the Most Profitable Level

## F. Conclusion

Marginal Revenue = \$.60

<u>Yield</u>	<u>Fertilizer</u>	Fertilizer $\Delta$ <u>Cost</u>	$\Delta$ <u>Cost</u>	$\Delta$ <u>Output</u>	Marginal <u>Cost</u>
679	30	\$13.50	none	none	none
684	33	\$14.85	\$1.35	5	\$.27
687	36	\$16.20	\$1.35	3	\$.45
689	39	\$17.55	\$1.35	2	\$.67
690	42	\$18.90	\$1.35	1	\$1.35

# Determine the Most Profitable Level

## F. Conclusion

687 kg of wheat should be grown by applying 36 kg of fertilizer per hectare because Marginal Cost is \$.45 and is less than Marginal Revenue which is \$.60. If the business owner were to raise 689 kg wheat by adding 3 more kg of fertilizer per hectare, the marginal cost increases greater than marginal revenue; therefore, the business owner would lose profit.

# Review

- What is the law of diminishing returns?
- What factors affect profit?
- How is the most profitable level of production determined?