

Penciling Out Dairy Production and Profit

Grade Level: 4-8

Lesson Overview

Students sometimes say, “When am I ever going to use this in real life?” Well, any time you produce something to make money, you need to keep track of the costs of production compared to the value of what is produced. Students will explore the profitability of milk production as they perform calculations using actual dairy statistics.

Student Objectives

1. Use computation skills to calculate profit.
2. Perform simple conversions of U.S. measurements.

Materials

- ✓ Penciling Out Dairy Production and Profit Worksheet

Vocabulary

- **consume** – to eat or drink.
- **profit** - difference between cost and gross income.
- **silage** – chopped plant material that has been allowed to ferment.

Background Information

One goal of a successful business is to make a profit. As students use their computation skills, they will learn more about the economics of the dairy industry. Some of the major challenges economically in the dairy industry are things out of the farmer’s control. For instance, dairy farmers are sometimes called “price-takers.” A price-taker is someone who lacks bargaining power in a marketplace and therefore has to accept the price dictated by those in power. The milk pricing system is complicated and ever changing. Then there are the costs of feed which may be affected by the weather and transportation costs. Farmers know there will be good years and bad years when it comes to making a profit. They hope for more good years than bad; and hope the good years can carry them through the bad ones.

Procedure

1. Instruct the students on how profit calculations are performed. Have students complete Penciling Out Dairy Production and Profit Worksheet. (Money earned – money spent = profit)

2. Instruct the students on how to perform simple conversions of U.S. measurement.

Extension Activities

1. Have students explore more about the economics of the dairy industry. Here are some sites to get started.
 - <https://www.farmanddairy.com/top-stories/a-brief-history-of-dairy-pricing/592392.html> Brief History of Dairy Pricing
 - <https://www.ers.usda.gov/webdocs/publications/98901/err-274.pdf?v=3938.6> Check out the charts on pages 5-7 of the USDA Consolidation in U.S. Dairy Farming showing: milk costs & returns comparison for 1980-2018, number of milk cows compared milk production for 1980-2018, and net returns by herd size for 2005-2018
 - https://farmdoc.illinois.edu/assets/management/whole-farm/FBM-0160milkcost_2019.pdf Cost to Produce Milk in Illinois 2019
 - <https://www.fb.org/market-intel/how-milk-is-priced-in-federal-milk-marketing-orders-a-primer> How Milk is Priced Primer
 - <https://www.fb.org/market-intel/how-milk-is-really-priced-in-the-u.s> How Milk is Really Priced in the U.S.
2. Look at some of the data collected over the years by the United States Department of Agriculture National Agricultural Statistics Service. There are lots of ways to search the data including looking by state, commodity, and census. Some of the historical documents are interesting to see what types of data were collected.
 - Annual Milk Prices: USDA/NASS QuickStats Ad-hoc Query Tool <https://quickstats.nass.usda.gov/#5116099E-44DF-3C4A-AA9F-8D736E62179B>
 - Historic annual milk prices are found in the historic Milk Production, Disposition, and Income publications (Milk PDI). Below is a link to NASS Reports by Title or Release Day. Click on the link, then click on 'M'. Under the 'M' publications, look for Milk PDI – Final Est. The final estimates publications are the best place to look for historic estimates because they should include any final revisions that may have been made.
https://www.nass.usda.gov/Publications/Reports_by_Release_Day/index.php#_340

- For pre-1980 prices, the monthly prices are in the old Agricultural Prices publications.
<https://usda.library.cornell.edu/concern/publications/c821gj76b?locale=en#release-items>

Standard

Illinois Mathematics Standard

CC.6.RP.3d Use ratio reasoning to convert measurement units; manipulate and transform units appropriately when multiplying or dividing quantities.

The **M**ultidisciplinary **A**gricultural **I**ntegrated **C**urriculum (mAGic) was created in 2004 under the leadership of the Illinois State Board of Education (ISBE) and the Facilitating Coordination in Agricultural Education Project (FCAE). Funding was made available through the FCAE grant budget from the agricultural education line item of the ISBE budget. This revision, as printed, was developed in September 2021.



These mAGic lessons are designed to bring agriculture to life in your classroom. They address the Illinois Learning Standards in math, science, English language arts and social studies.

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Name _____

Penciling Out Dairy Production and Profit Worksheet

| Item per cow | Daily | Yearly | Monthly | Weekly |
|----------------------------------|-------|---------|---------|--------|
| Gallons of Water Consumed | 40 | | | |
| Pounds of Grain Consumed | 25 | | | |
| Pounds of Hay or Silage Consumed | 35 | | | |
| Cost of Production | | \$3,416 | | |
| Pounds of Cheese Produced | 6 | | | |
| Pounds of Butter Produced | 2.9 | | | |
| Gallons of Milk Produced | 7 | | | |
| Value of Cow's Production | | \$3,933 | | |

Several sources were used including the National Agricultural Statistics Service and the University of Illinois Farm Business Management Resources.

Note: Dairy producers may have other sources of income and often additional expenses not reflected in these numbers. Due to various factors of which most are out of the farmer's control, there may be periods with no profit.

1. Complete the chart. Show your work.
2. What is the difference between the production per cow and the costs per cow in one year? (This is called the profit.)
3. If the farmer had 80 cows, what would his yearly profit be?
4. How many 8-ounce glasses of milk does the dairy cow produce in one day?
(8 ounces = one cup)
5. How many pints of milk does the dairy cow produce in one day?

6. How many quarts of milk does the dairy cow produce in one day?

7. Each person in the USA drinks about 23.2 gallons of milk per year. How many days does it take a dairy cow to make that much milk?

8. If each person in the USA eats about 30 pounds of cheese a year. How many cows does it take to make these 30 pounds of cheese a day?

9. If it takes 39 cups of milk to make one pound of butter. How many cups of milk are needed to make 10 cups of butter?

10. It takes one cup of milk to make 8 oz. of yogurt. How many cups does it take to make 64 oz. of yogurt?

Penciling Out Dairy Production and Profit Worksheet ANSWER KEY

| Item per cow | Daily | Yearly* | Monthly* | Weekly* |
|----------------------------------|---------|---------|----------|---------|
| Gallons of Water Consumed | 40 | 14,600 | 1,217 | 281 |
| Pounds of Grain Consumed | 25 | 9,125 | 760 | 147 |
| Pounds of Hay or Silage Consumed | 35 | 12,775 | 1,065 | 246 |
| Cost of Production | \$9.36 | \$3,416 | \$284.67 | \$65.69 |
| Pounds of Cheese Produced | 6 | 2,190 | 183 | 42 |
| Pounds of Butter Produced | 2.9 | 1,059 | 88 | 20 |
| Gallons of Milk Produced | 7 | 2,555 | 213 | 49 |
| Value of Cow's Production | \$10.78 | \$3,933 | \$327.75 | \$75.63 |

Several sources were used including the National Agricultural Statistics Service and the University of Illinois Farm Business Management Resources.

Note: Dairy producers may have other sources of income and often additional expenses not reflected in these numbers. Due to various factors of which most are out of the farmer's control, there may be periods with no profit.

****Note: Answers may vary, depending upon how computation was done. We used daily x 365=yearly, yearly/12=month and yearly/52=weekly.***

1. Complete the chart. Show your work.

2. What is the difference between the production per cow and the costs per cow in one year? (This is called the profit.)
\$3,933 value of cow's production – \$3,416 cost of production = \$517 total profit per cow

3. If the farmer had 80 cows, what would his yearly profit be?
\$517 total profit per cow x 80 cows = \$41,360 total yearly profit per hundredweight

4. How many 8-ounce glasses of milk does the dairy cow produce in one day?
 (8 ounces = one cup)
128 ounces/gallon x 7 gallons/day = 896 ounces/8 = 112 8-ounce glasses/per day
OR
16 cups/gallon x 7 gallons produced/day=112 cups or 8-ounce glasses/per day

5. How many pints of milk does the dairy cow produce in one day?
 $8 \text{ pints/gallon} \times 7 \text{ gallons/day} = 56 \text{ pints/day}$
6. How many quarts of milk does the dairy cow produce in one day?
 $4 \text{ quarts/gallon} \times 7 \text{ gallons/day} = 28 \text{ quarts/day}$
7. Each person in the USA drinks about 16.4 gallons of milk per year. How many days does it take a dairy cow to make that much milk?
 $16.4 \text{ gallons/year} / 7 \text{ gallons/day} = 2.3 \text{ days or } 2 \text{ days}$
8. If each person in the USA eats about 40 pounds of cheese a year. How many cows does it take to make these 30 pounds of cheese a day?
 $40 \text{ pounds of cheese} / 6 \text{ pounds/day} = 7 \text{ cows}$
9. If it takes 39 cups of milk to make one pound of butter. How many cups of milk are needed to make 10 cups of butter?
 $39 \text{ cups of milk to make one pound of butter} \times 10 \text{ cups of butter} = 390 \text{ cups of milk}$
10. It takes one cup of milk to make 8 oz. of yogurt. How many cups does it take to make 64 oz. of yogurt?
 $\text{cup} = 8 \text{ ounces of milk} = 8 \text{ ounces of yogurt } 64 \text{ ounces of yogurt} / 8 \text{ ounces/cup} = 8 \text{ cups}$