Agricultural Science I

Curriculum Guide: Introduction to Dairy Production

Unit Objective:
Students will demonstrate an understanding of the principles of dairy production by designing a dairy operation and explaining the parts of the operation on a poster that will be displayed in class.

Show-Me Standards: 2.1, CA6

References:


Students may use additional outside sources to complete this activity.

Instructional Strategies/Activities:
• Students will engage in study questions in lessons 1 through 6.
• Students will complete AS 4.1, Costs and Returns.
• Additional activities that relate to the unit objective can be found under the heading “Other Activities” in the following locations: p. 4 and p. 48.

Performance-Based Assessment:
Students will design an aerial view map of a complete dairy operation and present their map on a poster. They will label the facilities and include brief captions to explain why they chose the facilities and made the design decisions they did. Completed posters will be displayed in class.

Assessment will be based on the overall content and presentation of the dairy operation poster.
Introduction to Dairy Production
Instructor Guide

The instructor should assign the performance-based assessment activity at the beginning of the unit. Students will work toward completing the activity as they progress through the unit lessons. The assessment activity will be due at the completion of the unit.

1. Have students design an aerial view map of a complete dairy operation and present their map on a poster.

2. Have students label the facilities and include brief captions to explain why they chose the facilities and made the design decisions they did.

3. Explain the acceptable form or forms for students’ maps. For example, students could design their map by drawing, using collage, or other means.

4. If desired, lead the class in a discussion that will help them design their dairy operation. The map should reflect these design decisions, and the captions give the student the opportunity to explain his or her reasons for making them.
   a. Discussion questions might include the following.
      o What facilities will you need?
      o What type of milking parlor would you choose and why?
      o How will you store feed and waste?
   b. Additional information can be found at the University of Missouri Extension web site, such as Before You Go Into Dairying, accessed March 3, 2003, from http://muextension.missouri.edu/explore/agguides/dairy/g03500.htm.

5. Students may use additional outside material to complete their poster. Students may not use the source material word for word and must provide a complete bibliography of their sources along with their completed poster.

6. Display completed posters in class.

7. The final assessment score will be based on the overall content and presentation of the dairy operation poster.
Introduction to Dairy Production
Student Handout

1. Create an aerial view map of a complete dairy operation and present your map on a poster.

2. Label all facilities and include brief captions to explain why you chose the facilities and made the design decisions you did.

3. You may use additional outside material to complete your poster.

4. You may not use the source material word for word and must provide the instructor with a complete bibliography of your sources along with your completed poster.

5. Completed posters will be displayed in class.

6. Your final assessment score will be based on the overall content and presentation of your dairy operation poster.
# Agricultural Science I

## Introduction to Dairy Production

### Scoring Guide

<table>
<thead>
<tr>
<th>Assessment Area</th>
<th>Criteria</th>
<th>0 Points</th>
<th>1 Point</th>
<th>2 Points</th>
<th>3 Points</th>
<th>4 Points</th>
<th>Weight</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information and Content</td>
<td>Information is complete and facts are accurate</td>
<td>Failed</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
<td>X 7.5</td>
<td></td>
</tr>
<tr>
<td>Map Design</td>
<td>Map addresses all basic aspects of a dairy operation</td>
<td>Failed</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
<td>X 7.5</td>
<td></td>
</tr>
<tr>
<td>Captions</td>
<td>Captions explain the design of the dairy operation</td>
<td>Failed</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
<td>X 5</td>
<td></td>
</tr>
<tr>
<td>Organization</td>
<td>Well organized</td>
<td>Failed</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
<td>X 2.5</td>
<td></td>
</tr>
<tr>
<td>Technical Considerations</td>
<td>Spelling, grammar, and punctuation</td>
<td>Failed</td>
<td>Poor</td>
<td>Fair</td>
<td>Good</td>
<td>Excellent</td>
<td>X 2.5</td>
<td></td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
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<td></td>
</tr>
</tbody>
</table>

Final Assessment Total _______/100 pts.

Comments:
Student Outcome

Describe the importance of the dairy industry in Missouri.

Learning Objectives

1. Describe the economic importance of the dairy industry in Missouri.
2. Explain how the dairy industry has evolved.
3. Identify modern trends in the dairy industry.
4. Identify career opportunities available in the dairy industry.

Grade Level Expectations

SC/EC/3/B/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. Activity Sheet
   - AS 1 - A Career in the Dairy Industry
2. Introduction to Dairy Production (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1997.

Supplies & Equipment

- Milk carton from school’s cafeteria
- Current milk prices from extension office or local milk marketing cooperative

Supplemental Information

1. Internet Sites
2. Print
Interest Approach

Interest Approach

Obtain a milk carton from the school’s cafeteria. Ask students to calculate how much a gallon of milk would cost if purchased in the lunchroom size containers. Compare that figure to how much the farmer receives. (Contact the local milk marketing cooperative or extension office for current milk prices.)

Communicate the Learning Objectives

1. Describe the economic importance of the dairy industry in Missouri.
2. Explain how the dairy industry has evolved.
3. Identify modern trends in the dairy industry.
4. Identify career opportunities available in the dairy industry.

Instructor Directions

Objective 1

Discuss the economic importance of the dairy industry to Missouri. Focus the discussion on your local community and region of the state. Profile leading dairy areas of the state.

Content Outline

1. The many phases of the dairy industry generate valuable economic activity.
2. In the last couple decades, the number of dairy farms and cows has decreased in Missouri. Agricultural leaders hope to reverse this trend.
3. In 2006, Missouri ranked seventh in the United States for the number of milk cow operations and twenty-first in milk production.
4. In 2003, about 125,000 head of dairy cows were present throughout Missouri.
5. Each cow produced an average of 14,620 pounds of milk per year.
6. The dairy industry in Missouri is primarily located in the southwest.
7. Wright County was the top dairy county as of January 1, 2004, with 11,500 head of dairy cows.

Objective 2

Ask how the dairy industry has evolved in the United States. Compare dairies of today with those in the nineteenth century.

Communicate the Learning Objectives

1. Describe the economic importance of the dairy industry in Missouri.
2. Explain how the dairy industry has evolved.
3. Identify modern trends in the dairy industry.
4. Identify career opportunities available in the dairy industry.
<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
</table>
|                       | led to the growth of the dairy industry.  
|                       | 1. Refrigerated railroad cars for transport to urban areas.  
|                       | 2. Pasteurization of milk  
|                       | 3. Commercially produced cheese  
|                       | These advances allowed dairy production to become a commercial business, with dairy operations supplying milk to many people. |

**Objective 3**

*Ask how dairy operations are changing. Discuss the differences between past and current dairy trends.*

1. Decreasing number of operations nationwide with more cows per farm  
2. Increase in milk production of existing cows, due to management factors such as the use of BST (bovine somatotropin)  
3. Shift in the location of production from the Midwest to the western United States (California, Arizona, New Mexico)

**Objective 4**

*Have students list careers associated with the dairy industry. Point out that most of the careers in the dairy industry are not in the production of milk.*

1. Dairy producer  
2. Loan officer  
3. Geneticist  
4. Feed company representative  
5. Veterinarian  
6. Equipment sales and service representative  
7. Fluid milk hauler  
8. Processing plant supervisor  
9. Sales representative for dairy food products

**Application:**

- **AS 1 - A Career in the Dairy Industry**

  Answers to AS 1  
  Answers will vary.

  Other activities:  
  Schedule a guest speaker who is actively involved in the dairy industry to discuss careers and the future of the industry.

**Closure/Summary**

The dairy industry is an important part of Missouri agriculture and generates valuable economic activity. In Missouri over the last two decades, the number of dairy
operations and cows has decreased. Dairy production in Missouri is primarily centered in the southwestern part of the state. The general trend in the dairy industry is toward fewer dairy operations, more cows per operation, and increased milk production per cow.

### Evaluation: Quiz

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Answers:</td>
</tr>
<tr>
<td>1.</td>
<td>c</td>
</tr>
<tr>
<td>2.</td>
<td>d</td>
</tr>
<tr>
<td>3.</td>
<td>c</td>
</tr>
<tr>
<td>4.</td>
<td>Refrigerated railroad cars allowed producers to ship their milk long distances to urban areas. Milk began to be pasteurized. Commercially manufactured cheese became available.</td>
</tr>
<tr>
<td>5.</td>
<td>Answers may include any three of the following: dairy producer, loan officer, geneticist, feed company representative, veterinarian, equipment sales and service representative, fluid milk hauler, processing plant supervisor, or sales representative for dairy food products.</td>
</tr>
</tbody>
</table>
A Career in the Dairy Industry

Objective: Learn more about the dairy industry by conducting an interview with someone working in the dairy industry.

Interview a person with a career in the dairy industry. Record his or her name, occupation, and place of employment. Use the questions on this sheet as an aid when interviewing the individual. Write down the answers to questions, as well as any other information that is important. Then, make a report about the career to the class.

Name:

Occupation:

Place of Employment:

How long have you worked in your present occupation?

Why did you choose this career?

What training was necessary for this job?

What skills do you use?
What jobs have you had previously that helped prepare you for this one?

What other jobs have you considered?

What are your career plans for the future?

What advice would you give someone who is considering a career in this area?

Comments:
Researching Dairy Breeds

Objective: Become familiar with the various breeds of dairy cattle.

Obtain the address of one of the dairy breed associations from your instructor. Write a letter to the association requesting information, pictures, videos, etc., for that breed.

When you receive the material from the breed association, prepare a report for the class. Your report should answer the following questions.

- What is the official name of the breed association?
- What is the history of the breed?
- When was the breed association formed?
- What are the standards for registration?
- What characteristics would disqualify an animal for registration?
- What are the important traits of the breed?
UNIT - INTRODUCTION TO DAIRY PRODUCTION Name ________________________

Lesson 1: Introduction to the Dairy Industry Date _______________________

EVALUATION

Circle the letter that corresponds to the best answer.

1. How many dairy cows were found in Missouri in 2003?
   a. 90,000  
   b. 105,000  
   c. 125,000  
   d. 150,000

2. Which area of the state has the most dairy operations?
   a. Southeast  
   b. Northeast  
   c. Central  
   d. Southwest

3. Which of the following is a current trend in the dairy industry?
   a. Increasing number of operations  
   b. Moving from populated to less populated areas  
   c. Increasing number of cows per farm  
   d. Decreasing milk production in existing cows

Complete the following short answer questions.

4. What changes in the dairy industry occurred in the nineteenth century?
5. What are three careers in the dairy industry?
   a.
   b.
   c.
Student Outcome

Identify the major dairy breeds in Missouri and their significance to the dairy industry.

Learning Objectives

1. Describe the identifying characteristics and histories of the six major dairy breeds in Missouri.
2. Explain the factors that influence breed selection.

Grade Level Expectations

SC/LO/1/E/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slide
   - Ppt 1 - Dairy Breeds
2. Activity Sheets
   - AS 1 - Dairy Breeds
   - AS 2 - Researching Dairy Breeds
3. Introduction to Dairy Production (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1997.

Supplies & Equipment

- Photos of a red and white Holstein or Ayrshire

Supplemental Information

1. Internet Sites
2. Print
In Instructor Directions:

Objective 1

Discuss the six major dairy breeds and have students complete the chart on AS 1. Point out that Holsteins are by far the dominant dairy breed. Have students complete AS 2 to find more in-depth information about a dairy breed.

<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 1</td>
<td>Describe the identifying characteristics and histories of the six major dairy breeds in Missouri.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ppt 1 - Dairy Breeds</th>
<th>Ayrshire</th>
</tr>
</thead>
<tbody>
<tr>
<td>AS 1 - Dairy Breeds</td>
<td>1. Red and white</td>
</tr>
<tr>
<td>AS 2 - Researching Dairy Breeds</td>
<td>2. Excellent grazers with high quality udders</td>
</tr>
<tr>
<td></td>
<td>3. Not used extensively in the dairy industry because of their comparatively low milk production</td>
</tr>
<tr>
<td></td>
<td>4. Imported from Scotland in the early nineteenth century</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Brown Swiss</th>
<th>1. Light to dark brown with black noses and tongues</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Large in size</td>
</tr>
<tr>
<td></td>
<td>3. Rank second to Holsteins in average pounds of milk produced per animal</td>
</tr>
<tr>
<td></td>
<td>4. Heat-tolerant breed often used in tropical areas of the world</td>
</tr>
<tr>
<td></td>
<td>5. Used as a dual purpose breed for milk and beef production</td>
</tr>
<tr>
<td></td>
<td>6. Imported from Switzerland in 1869</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Guernsey</th>
<th>1. Pale yellow and white</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Golden color to milk due to high levels of beta-carotene, a source of vitamin A</td>
</tr>
<tr>
<td></td>
<td>3. Second to Jerseys in the percentage of fat and protein in milk</td>
</tr>
<tr>
<td></td>
<td>4. Imported from the Isle of Guernsey in the early 1800s</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Holstein</th>
<th>1. Most popular dairy breed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2. Black and white; occasionally red and white</td>
</tr>
<tr>
<td></td>
<td>3. Largest of the dairy breeds in size</td>
</tr>
</tbody>
</table>

In Communicate the Learning Objectives:

1. Describe the identifying characteristics and histories of the six major dairy breeds in Missouri.
2. Explain the factors that influence breed selection.

Interest Approach

Obtain a photo of a red and white dairy cow, either a red Holstein or Ayrshire. Have students guess which breed it is.
<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>4. Rank first in the average pounds of milk produced per animal</td>
<td></td>
</tr>
<tr>
<td>5. Imported from the Netherlands in the early seventeenth century</td>
<td></td>
</tr>
<tr>
<td>Jersey</td>
<td></td>
</tr>
<tr>
<td>1. Fawn, light brown, gray, or almost black</td>
<td></td>
</tr>
<tr>
<td>2. Smallest in size</td>
<td></td>
</tr>
<tr>
<td>3. Produce milk that has the highest percentage of milk fat and milk protein</td>
<td></td>
</tr>
<tr>
<td>4. More tolerant of heat stress than Holsteins</td>
<td></td>
</tr>
<tr>
<td>5. Imported from the Isle of Jersey in the early nineteenth century</td>
<td></td>
</tr>
<tr>
<td>Milking Shorthorn</td>
<td></td>
</tr>
<tr>
<td>1. Red, white, or any combination of the two</td>
<td></td>
</tr>
<tr>
<td>2. Dual purpose breed used for both beef and milk production</td>
<td></td>
</tr>
<tr>
<td>3. Recognized as a breed in the 1940s</td>
<td></td>
</tr>
<tr>
<td>4. Originated in England</td>
<td></td>
</tr>
</tbody>
</table>

**Objective 2**

*Ask students to describe how a breed is selected. Make sure students focus on the goals of the individual producer.*

<table>
<thead>
<tr>
<th>Explain the factors that influence breed selection.</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Breed selection depends on the goals of the producer.</td>
</tr>
<tr>
<td>2. The primary goal of most producers is to maximize milk production, which is why Holsteins are the most popular dairy breed.</td>
</tr>
<tr>
<td>3. Other breeds have desirable qualities that the producer may wish to add to his or her herd (e.g., more milk fat and milk protein).</td>
</tr>
</tbody>
</table>

**Application:**

- **AS 1 - Dairy Breeds**
  - Answers to AS 1
  - See the content for Objective 1.

- **AS 2 - Researching Dairy Breeds**
  - Answers to AS 2
  - Results will vary.

**Other activities:**

*Have students search the Internet for information on different breeds. Oklahoma State University has a Website ([http://www.ansi.okstate.edu/breeds/](http://www.ansi.okstate.edu/breeds/)) that covers many breeds of livestock, including dairy cattle.*

**Closure/Summary**

The major dairy breeds are Ayrshire, Brown Swiss,
Guernsey, Holstein, Jersey, and Milking Shorthorn. Most producers seek to maximize milk production when selecting a breed, although a producer may choose another breed to achieve a particular goal.

<table>
<thead>
<tr>
<th>Evaluation: Quiz</th>
<th>Answers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. d</td>
<td>10. The primary goal of most producers is to maximize milk production.</td>
</tr>
<tr>
<td>2. f</td>
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<td>3. e</td>
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<td>4. a</td>
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<tr>
<td>5. f</td>
<td></td>
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<tr>
<td>6. b</td>
<td></td>
</tr>
<tr>
<td>7. c</td>
<td></td>
</tr>
<tr>
<td>8. b</td>
<td></td>
</tr>
<tr>
<td>9. d</td>
<td></td>
</tr>
</tbody>
</table>
Objective: Identify the distinguishing characteristics of the six major dairy breeds.

Fill in the table with information about each of the dairy cattle breeds listed.

<table>
<thead>
<tr>
<th>Breed Name</th>
<th>Color</th>
<th>When Imported</th>
<th>Origin</th>
<th>Notable Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ayrshire</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brown Swiss</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Guernsey</td>
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<td></td>
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</tr>
<tr>
<td>Holstein</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Jersey</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Milking Shorthorn</td>
<td></td>
<td></td>
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<td></td>
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Objective: Become familiar with the various breeds of dairy cattle.

Obtain the address of one of the dairy breed associations from your instructor. Write a letter to the association requesting information, pictures, videos, etc., for that breed.

When you receive the material from the breed association, prepare a report for the class. Your report should answer the following questions.

- What is the official name of the breed association?
- What is the history of the breed?
- When was the breed association formed?
- What are the standards for registration?
- What characteristics would disqualify an animal for registration?
- What are the important traits of the breed?
EVALUATION

Write the letter of the breed in the right-hand column next to the best description in the left-hand column. Letters may be used more than once.

1. _____ Yellow and white  
   a. Milking Shorthorn

2. _____ Black and white  
   b. Brown Swiss

3. _____ Highest percentage of milk fat  
   c. Ayrshire

4. _____ Recognized as a breed in the 1940s  
   d. Guernsey

5. _____ Ranked first in pounds of milk per animal  
   e. Jersey

6. _____ Imported from Switzerland  

7. _____ Imported from Scotland  

8. _____ Black noses and tongues  

9. _____ Golden color to milk  

Complete the following short answer question.

10. What is the primary goal of most dairy producers?
Student Outcome

Use available information to select dairy cattle.

Learning Objectives

1. Identify the parts of a dairy cow.
2. Describe how the Dairy Cow Unified Score Card is used in the classification of dairy cattle.
3. Explain how linear evaluation is used in dairy herd improvement.

Grade Level Expectations

SC/LO/3/E/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slides
   - Ppt 1 - Parts of a Dairy Cow
   - Ppt 2 - Dairy Cow Unified Score Card
2. Activity Sheets
   - AS 1 - Parts of a Dairy Cow
   - AS 2 - Linear Evaluation
3. Introduction to Dairy Production (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1997.

Supplies & Equipment

- Four to six pictures of dairy cows

Supplemental Information

1. Internet Sites
2. Print
Interest Approach

Show the students pictures of several dairy cows. Have them try to classify the cows by their visible traits.

Communicate the Learning Objectives

1. Identify the parts of a dairy cow.
2. Describe how the Dairy Cow Unified Score Card is used in the classification of dairy cattle.
3. Explain how linear evaluation is used in dairy herd improvement.

<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Objective 1</strong></td>
<td>Identify the parts of a dairy cow.</td>
</tr>
</tbody>
</table>
| Explain to students the importance of using proper terminology when describing dairy cattle. Use PPt 1 to illustrate the parts of the dairy cow. Have students complete AS 1. | 1. Face  
2. Muzzle  
3. Jaw  
4. Neck  
5. Throat  
6. Dewlap  
7. Brisket  
8. Floor of the chest  
9. Barrel  
10. Milk wells  
11. Mammary veins  
12. Fore udder attachment  
13. Ribs  
14. Teat  
15. Pastern  
16. Hoof  
17. Dewclaw  
18. Switch  
19. Hock  
20. Rear flank  
21. Thigh  
22. Pin Bones  
23. Tail head  
24. Thurl  
25. Hooks  
26. Withers  
27. Heart girth  
28. Poll  
29. Rump  
30. Loin  
31. Chine |

☐ PPt 1 - Parts of a Dairy Cow

☑ AS 1 - Parts of a Dairy Cow
### Instructor Directions

#### Objective 2

*Begin a discussion by passing out a copy of the current Dairy Cow Unified Score Card as found in the contest bulletin. Using Ppt 2, ask for input on the various parts of the card.*

- **Ppt 2 - Dairy Cow Unified Score Card**

#### Content Outline

**Describe how the Dairy Cow Unified Score Card is used in the classification of dairy cattle.**

Cows are compared to an ideal cow (which is assigned a score of 100 points) and classified according to their scores.

1. **Excellent** — 90-100 points
2. **Very good** — 85-89 points
3. **Good Plus** — 80-84 points
4. **Good** — 75-79 points
5. **Fair** — 70-74 points
6. **Poor** — less than 70 points

The score card looks at five major traits.

1. **Frame** — evaluation of the skeletal parts of the cow except feet and legs
2. **Dairy character** — evaluation of milking ability
3. **Body capacity** — evaluation of the volume of the cow
4. **Feet and legs** — evaluation of the cow’s skeletal soundness, or ability to move easily
5. **Udder**
   a. Most important part of the dairy cow
   b. Evaluation for milk production and productivity over time

#### Objective 3

*Ask the class what linear evaluation is. List the seventeen functional traits on the board or overhead. Discuss how producers can select to improve specific traits using linear evaluation.*

**Explain how linear evaluation is used in dairy herd improvement.**

In linear evaluation, a computer program is used to score cattle for individual traits; producers use this information to improve the functional type of dairy herd by selecting animals for breeding.

Seventeen linear traits are used in evaluating cows, with traits assigned a numerical score between one and fifty.

1. **Stature**
2. **Strength**
3. **Body depth**
4. **Dairy form**
5. **Rump angle**
6. **Rump width**
7. **Rear legs (side view)**
8. **Foot angle**
### Instructor Directions

9. Fore udder attachment
10. Rear udder height
11. Rear udder width
12. Udder cleft
13. Udder depth
14. Front teat placement
15. Teat length
16. Rear legs (rear view)
17. Udder tilt

Producers can pinpoint specific traits in cows that should be improved and then select bulls for breeding.

They can also evaluate and select bulls for breeding by using their daughters’ scores.

### Application:

- AS 1 - Parts of a Dairy Cow

<table>
<thead>
<tr>
<th>Answers to AS 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Face</td>
</tr>
<tr>
<td>2. Muzzle</td>
</tr>
<tr>
<td>3. Jaw</td>
</tr>
<tr>
<td>4. Neck</td>
</tr>
<tr>
<td>5. Throat</td>
</tr>
<tr>
<td>6. Dewlap</td>
</tr>
<tr>
<td>7. Brisket</td>
</tr>
<tr>
<td>8. Floor of the chest</td>
</tr>
<tr>
<td>9. Barrel</td>
</tr>
<tr>
<td>10. Milk wells</td>
</tr>
<tr>
<td>11. Mammary veins</td>
</tr>
<tr>
<td>12. Fore udder attachment</td>
</tr>
<tr>
<td>13. Ribs</td>
</tr>
<tr>
<td>14. Teat</td>
</tr>
<tr>
<td>15. Pastern</td>
</tr>
<tr>
<td>16. Hoof</td>
</tr>
<tr>
<td>17. Dewclaw</td>
</tr>
<tr>
<td>18. Switch</td>
</tr>
<tr>
<td>19. Hock</td>
</tr>
<tr>
<td>20. Rear flank</td>
</tr>
<tr>
<td>21. Thigh</td>
</tr>
<tr>
<td>22. Rear udder attachment</td>
</tr>
<tr>
<td>23. Tail</td>
</tr>
<tr>
<td>24. Pin bones</td>
</tr>
<tr>
<td>25. Tail head</td>
</tr>
<tr>
<td>26. Thurl</td>
</tr>
</tbody>
</table>
### Instructor Directions

<table>
<thead>
<tr>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>27. Hooks</td>
</tr>
<tr>
<td>28. Withers</td>
</tr>
<tr>
<td>29. Heart girth</td>
</tr>
<tr>
<td>30. Poll</td>
</tr>
<tr>
<td>31. Rump</td>
</tr>
<tr>
<td>32. Loin</td>
</tr>
<tr>
<td>33. Chine</td>
</tr>
<tr>
<td>34. Back</td>
</tr>
</tbody>
</table>

### AS 2 - Linear Evaluation

#### Answers to AS 2

1. The cow is fine for fifteen of the seventeen traits. However, udder depth (UD) is too low and teat placement (TP) is too wide. When the cow is mated, the producer should pay particular attention to udder depth and teat placement.

2. Cow 2 has problems with stature (ST), rump angle (RA), and udder cleft (UC). The cow is small, and its rump has a severe slope from hooks to pins. The cow also has little, if any, cleft in her udder. The producer should select for these traits when mating the cow.

### Closure/Summary

Dairy producers need to be aware of the parts of a dairy cow and how to evaluate and select dairy animals. The Dairy Cow Unified Score Card provides a basis for evaluation. Linear evaluation is often used when selecting animals for breeding.

### Evaluation: Quiz

#### Answers:

1. b
2. g
3. d
4. c
5. i
6. e
7. f
8. j
9. h
10. a
11. c
12. d
13. b
14. Answers may include any three of the following: stature, strength, body depth, dairy form, rump angle, rump width, rear legs (side view), foot angle, fore
<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>udder attachment, rear udder height, rear udder width, udder cleft, udder depth, front teat placement, teat length, rear legs (rear view), or udder tilt.</td>
</tr>
<tr>
<td>15. Producers use the information from linear evaluation to improve the functional type of the dairy herd by selecting animals for breeding.</td>
<td></td>
</tr>
</tbody>
</table>
Objective: Identify the parts of a dairy cow.

Write the names of the parts of a dairy cow in the numbered blanks.
**Objective:** Use linear evaluation to evaluate cows.

Looking at the linear traits described below, evaluate the cows by looking at the scores they have received for the seventeen traits. Describe the problems with each cow that could be selected for improvement. The cow’s scores for a particular trait should be within five points of the ideal score.

### Linear Traits

*most desirable score

<table>
<thead>
<tr>
<th>Trait</th>
<th>1-5 Description</th>
<th>25 Description</th>
<th>45-50 Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stature (ST)</td>
<td>Extremely short</td>
<td>Intermediate</td>
<td>Extremely tall*</td>
</tr>
<tr>
<td>Strength (SR)</td>
<td>Extremely narrow and frail</td>
<td>Intermediate</td>
<td>Extremely strong and wide*</td>
</tr>
<tr>
<td>Body Depth (BD)</td>
<td>Extremely shallow body</td>
<td>Intermediate</td>
<td>Extremely deep body*</td>
</tr>
<tr>
<td>Dairy Form (DF)</td>
<td>Extremely tight</td>
<td>Intermediate*</td>
<td>Extremely open</td>
</tr>
<tr>
<td>Rump Angle (RA)</td>
<td>Pins clearly higher than hooks</td>
<td>Slight slope from hooks to pins*</td>
<td>Extremely sloped from hooks to pins</td>
</tr>
<tr>
<td>Rump Width (RW)</td>
<td>Extremely narrow</td>
<td>Intermediate</td>
<td>Extremely wide*</td>
</tr>
<tr>
<td>Rear Legs - side view (LS)</td>
<td>Posty and straight</td>
<td>Intermediate set*</td>
<td>Extremely sickled</td>
</tr>
<tr>
<td>Foot Angle (FA)</td>
<td>Extremely low angle</td>
<td>Intermediate*</td>
<td>Extremely steep</td>
</tr>
<tr>
<td>Feature</td>
<td>Score</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>-------------------------------</td>
<td>--------</td>
<td>--------------------------------------------------</td>
<td></td>
</tr>
<tr>
<td>Fore Udder Attachment (FU)</td>
<td>1-5</td>
<td>Extremely loose</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Intermediate strength</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-50</td>
<td>Extremely snug and strong*</td>
<td></td>
</tr>
<tr>
<td>Rear Udder Height (UH)</td>
<td>1-5</td>
<td>Extremely low</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Intermediate height</td>
<td></td>
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<td></td>
<td>45-50</td>
<td>Extremely high*</td>
<td></td>
</tr>
<tr>
<td>Rear Udder Width (UW)</td>
<td>1-5</td>
<td>Narrow rear udder</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Intermediate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-50</td>
<td>Extremely wide rear udder*</td>
<td></td>
</tr>
<tr>
<td>Udder Cleft (UC)</td>
<td>1-5</td>
<td>Weak cleft</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Intermediate</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-50</td>
<td>Extremely strong cleft*</td>
<td></td>
</tr>
<tr>
<td>Udder Depth (UD)</td>
<td>1-5</td>
<td>Very deep udder floor below hocks</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Intermediate*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-50</td>
<td>Extremely high</td>
<td></td>
</tr>
<tr>
<td>Front Teat Placement (TP)</td>
<td>1-5</td>
<td>Extremely wide on outside of quarters</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Centrally placed*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-50</td>
<td>Base of teats on inside of quarters</td>
<td></td>
</tr>
<tr>
<td>Teat Length (TL)</td>
<td>1-5</td>
<td>1-1/4 inches or smaller</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>2-1/4 inches*</td>
<td></td>
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<tr>
<td></td>
<td>45-50</td>
<td>3-1/4 inches or longer</td>
<td></td>
</tr>
<tr>
<td>Rear Legs - rear view (RL)</td>
<td>1-5</td>
<td>Severe toe out</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-50</td>
<td>No toe out*</td>
<td></td>
</tr>
<tr>
<td>Udder Tilt (UT)</td>
<td>1-5</td>
<td>Rear quarters deep</td>
<td></td>
</tr>
<tr>
<td></td>
<td>25</td>
<td>Front and rear quarters level*</td>
<td></td>
</tr>
<tr>
<td></td>
<td>45-50</td>
<td>Front quarters deep</td>
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1. Cow 1

<p>| | |</p>
<table>
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<tr>
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<td>SR</td>
<td>43</td>
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<td>BD</td>
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<tr>
<td>DF</td>
<td>22</td>
</tr>
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<td>RA</td>
<td>29</td>
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<td>RW</td>
<td>48</td>
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<td>LS</td>
<td>21</td>
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<td>FA</td>
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<tbody>
<tr>
<td>UH</td>
<td>43</td>
</tr>
<tr>
<td>UW</td>
<td>45</td>
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<tr>
<td>UC</td>
<td>46</td>
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<td>15</td>
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<tr>
<td>TP</td>
<td>7</td>
</tr>
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<td>TL</td>
<td>27</td>
</tr>
<tr>
<td>RL</td>
<td>46</td>
</tr>
<tr>
<td>UT</td>
<td>30</td>
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</table>

2. Cow 2

<p>| | |</p>
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<tr>
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<td>SR</td>
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<tr>
<td>BD</td>
<td>44</td>
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<tr>
<td>DF</td>
<td>25</td>
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<td>RA</td>
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<td>RW</td>
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<td>LS</td>
<td>25</td>
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<tr>
<td>FA</td>
<td>25</td>
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<tr>
<td>FU</td>
<td>43</td>
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<tbody>
<tr>
<td>UH</td>
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<tr>
<td>UW</td>
<td>45</td>
</tr>
<tr>
<td>UC</td>
<td>1</td>
</tr>
<tr>
<td>UD</td>
<td>25</td>
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<tr>
<td>TP</td>
<td>25</td>
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<td>TL</td>
<td>25</td>
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<tr>
<td>RL</td>
<td>48</td>
</tr>
<tr>
<td>UT</td>
<td>30</td>
</tr>
</tbody>
</table>
Write the letter from the diagram in the blank next to the name of that part of the cow.

1. _____ Milk wells
2. _____ Rear udder attachment
3. _____ Rump
4. _____ Teat
5. _____ Barrel
6. _____ Hooks
7. _____ Rear flank
8. _____ Fore udder attachment
9. _____ Muzzle
10. _____ Chine
Circle the letter that corresponds with the best answer.

11. Which of the traits on the Dairy Cow Unified Score Card is the most important for evaluation?
   a. Frame  
   b. Body capacity  
   c. Udder  
   d. Feet and legs

12. How many individual traits does linear classification take into account?
   a. 14  
   b. 15  
   c. 16  
   d. 17

13. On the Dairy Cow Unified Score Card, “dairy character” is an evaluation of:
   a. Volume  
   b. Milking ability  
   c. Ability to move easily  
   d. Productivity over time

Complete the following short answer questions.

14. What are three of the linear traits used in evaluation?
   a.  
   b.  
   c.  

15. How do producers use linear evaluation?
List management factors important to profitable dairy production.

Learning Objectives

1. Identify the production costs for operating a dairy.
2. Describe the facility requirements for dairy production.
3. Describe the factors that must be considered in raising replacement heifers.
4. Explain the factors to consider in reproductive management.
5. Describe the nutritional requirements for dairy cattle.
6. Explain the feeding methods for dairy cattle.
7. Identify the records that must be kept for profitable dairy production.
8. Describe the factors involved in marketing dairy products.

Grade Level Expectations

SC/LO/1/B/09-11/b SC/ST/1/B/09-11/a SC/ST/1/C/09-11/a

Resources, Supplies & Equipment, and Supplemental Information

Resources

1. PowerPoint Slide
   PPt 1 - Lactation Curve of the Dairy Cow
2. Activity Sheet
   AS 1 - Costs and Returns
3. Introduction to Dairy Production (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1997.

Supplies & Equipment

- Empty gallon milk jug

Supplemental Information

1. Internet Sites
2. Print

3. Electronic Media
**Interest Approach**

Bring an empty gallon milk jug and ask the class how much milk would cost in the store. Compare that price to how much the dairy producer makes per gallon. (Contact the local milk cooperative or extension office for current milk prices.) Ask students to list facilities, equipment, and other requirements for a dairy farm. Discuss how much these things cost. Compare the cost of dairy production to the returns from milk sales.

**Communicate the Learning Objectives**

1. Identify the production costs for operating a dairy.
2. Describe the facility requirements for dairy production.
3. Describe the factors that must be considered in raising replacement heifers.
4. Explain the factors to consider in reproductive management.
5. Describe the nutritional requirements for dairy cattle.
6. Explain the feeding methods for dairy cattle.
7. Identify the records that must be kept for profitable dairy production.
8. Describe the factors involved in marketing dairy products.

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**Instructor Directions**

**Objective 1**

Ask students to list production costs for a dairy operation. Write the list on the board or overhead. MU Guide Sheet G3651 can be used as a specific reference for a dairy cattle budget. Have students complete the budget in AS 1.

**Content Outline**

- Identify the production costs for operating a dairy.
  1. Facilities
  2. Feed—major cost on a daily basis
  3. Labor
  4. Marketing fees
  5. Fees for milk testing
  6. Veterinary fees and medicines
  7. Building repair and maintenance

**Objective 2**

Ask the class to list the facility requirements for a dairy operation. Write down the responses and then elaborate on each response. Remind students that dairy production may take place in a large-scale, labor-intensive environment.

**Content Outline**

- Describe the facility requirements for dairy production.
  1. Milking parlors
  2. Designs
     a. Parallel
        - Cows stand at a 90° angle on both sides of a pit where the milkers stand.
        - The milking unit is attached between the hind legs.
     b. Herringbone
        - Cows stand at an angle on both sides of the pit.
<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>-The design allows easy access to each cow’s udder from the side for putting on and removing the milking units.</td>
<td></td>
</tr>
<tr>
<td>Free stall or stanchion barns</td>
<td></td>
</tr>
<tr>
<td>1. In free stall barns, cows move freely between the separate stalls.</td>
<td></td>
</tr>
<tr>
<td>2. In stanchion barns, a headgate or a chain and collar confines cows to their stalls.</td>
<td></td>
</tr>
<tr>
<td>Feed storage</td>
<td></td>
</tr>
<tr>
<td>1. Upright silos and pit silos hold corn silage and haylage.</td>
<td></td>
</tr>
<tr>
<td>2. Grain and bulk bins hold prepared feed or supplements.</td>
<td></td>
</tr>
<tr>
<td>Waste storage</td>
<td></td>
</tr>
<tr>
<td>1. Lagoons are artificial waste holding areas that resemble ponds.</td>
<td></td>
</tr>
<tr>
<td>2. A watertight concrete or coated steel tank may also be used for manure storage; tanks may be above or below ground.</td>
<td></td>
</tr>
<tr>
<td>Heifer development facilities</td>
<td></td>
</tr>
<tr>
<td>1. Calves are kept individually in hutches until weaning.</td>
<td></td>
</tr>
<tr>
<td>2. They are then moved to group pens.</td>
<td></td>
</tr>
</tbody>
</table>

**Objective 3**

*Ask students what should be considered when raising replacement heifers. For specific feeding programs, consult National Research Council (NRC) recommendations.*

*Describe the factors that must be considered in raising replacement heifers.*

Dairy producers should consider the number of females needed each year as well as proper development.

Heifers should be ready to calve at 24 months of age and weigh 1,000 to 1,300 pounds, depending on the breed.

Careful feeding is essential if heifers are to reach this weight at the right time for breeding.

1. Small, thin heifers give less milk.
2. Heifers should not be allowed to become too fat, since excessive fat deposits in the udder may reduce future milk production.

**Objective 4**

*Explain the factors to consider in reproductive management.*
Ask the class what factors dairy producers must take into account when managing the reproductive aspect of dairy farming. Use Ppt 1 to illustrate the lactation curve.

- Ppt 1 - Lactation Curve of the Dairy Cow

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<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cows must become pregnant and calve for lactation to begin.</td>
<td></td>
</tr>
<tr>
<td>Lactation usually peaks at eight weeks after calving and then slowly declines.</td>
<td></td>
</tr>
<tr>
<td>Cows should be rebred 40 to 100 days after calving to maintain the cycle of milk production.</td>
<td></td>
</tr>
<tr>
<td>Cows are dried off at 40 to 50 weeks of lactation, depending on the amount of milk produced and the expected calving date; most operators will dry off cows when milk production drops below 35 to 40 pounds daily.</td>
<td></td>
</tr>
<tr>
<td>The dry period should last 40 to 70 days, with an average of 60 days.</td>
<td></td>
</tr>
<tr>
<td>Most dairy cows are artificially inseminated.</td>
<td></td>
</tr>
<tr>
<td>1. Permits the dairy producer to use bulls that are genetically superior</td>
<td></td>
</tr>
<tr>
<td>2. Helps in controlling the spread of reproductive diseases</td>
<td></td>
</tr>
<tr>
<td>3. Allows producers to keep more accurate records about reproduction, including breeding dates that can be used to calculate the expected calving dates needed to figure the proper dry period</td>
<td></td>
</tr>
<tr>
<td>4. Also used because of the problems associated with keeping a dairy bull on the farm, since dairy bulls are often very aggressive</td>
<td></td>
</tr>
<tr>
<td>Some producers use embryo transfer to increase the spread of superior genetics in the herd.</td>
<td></td>
</tr>
</tbody>
</table>

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**Objective 5**

List the various components of proper nutrition necessary for dairy cattle rations. Ask the class how to determine the nutritional requirements for dairy cattle. Obtain copies of NRC requirements for dairy cattle diets if students are interested in specific feeding programs.

Describe the nutritional requirements for dairy cattle.

1. Nutritional requirements include energy (from carbohydrates and fats), protein, vitamins, minerals, and water.
2. The cow’s nutritional needs are highest when lactation peaks.
3. Lactating cows should consume 3 to 4 percent of their body weight as dry matter.
4. Roughages should make up at least 40 percent of the diet to maintain correct microbe populations in the
<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
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<tbody>
<tr>
<td></td>
<td>rumen.</td>
</tr>
<tr>
<td></td>
<td>5. The cow’s production level and body condition determine the exact nutrient needs of the cow.</td>
</tr>
</tbody>
</table>

**Objective 6**

*Discuss the different feeding methods that can be used to meet the nutritional needs of dairy cows.*

**Explain the feeding methods for dairy cattle.**

**Traditional feeding method**
1. This method involves feeding forages and grain separately.
2. Forages may be fed as pasture or as hay or silage.
3. Protein supplements, or concentrates, are added to the diet to increase the amount of protein; they may be fed in the barn mangers or in the milking parlor during milking.

**Management-intensive grazing**
1. Producers rotate cows between grazing units in a preplanned cycle.
2. Cows are moved when they consume the forages on the grazing unit.
3. This type of grazing system helps lower costs by reducing the costs associated with equipment for harvesting forages and purchased feeds.

**Total mixed ration**
1. A total mixed ration is a mixture of all the feed ingredients needed by dairy cattle, including forages, grain, and supplements.
2. Advantages include being able to feed a precisely balanced ration and reduced labor.
3. Special equipment for weighing and mixing the ration must be purchased.
4. Existing facilities may also need to be modified to feed total mixed rations.

**Objective 7**

*Ask students what records should be kept for the dairy operation to run smoothly.*

**Identify the records that must be kept for profitable dairy production.**

1. Dairy Herd Improvement Association (DHIA) records—contain information on milk production levels and milk composition for individual cows
2. Breeding and calving dates
3. Calving dates and pedigrees for registered animals

**Objective 8**

*Describe the factors involved in marketing dairy products.*
Ask the class how milk is marketed in the United States. Explain the role that the United States government plays in controlling the price of fluid milk.

<table>
<thead>
<tr>
<th>Application:</th>
<th>Contents Outline</th>
</tr>
</thead>
</table>
| AS 1 - Costs and Returns | 1. Most of the milk is sold through cooperatives; producers are members of the cooperative, and they sell directly to it.  
2. The federal government sets base milk prices paid to producers to maintain a steady consumer milk price.  
3. Producers receive bonuses based on the fat and protein content of their milk and low somatic cell counts. |

**Answers to AS 1**

1. (a) 175,500  
   (b) 1,755  
2. $14  
3. 24,570  
4. 2,200  
5. 0  
6. 26,770  
7. (a) 6,000  
   (b) 300  
   (c) 250  
   (d) 0  
   (e) 200  
8. (a) 19  
   (b) $6  
   (c) 114  
9. 6,864  
10. (a) 1,750  
    (b) 290  
    (c) $6  
    (d) 1,740  
    (e) 1,400  
    (f) 80%  
    (g) 3,912  
11. 1,300  
12. 0  
13. 150  
14. 600  
15. 500  
16. 100  
17. 200  
18. 195  
19. 625
### Instructor Directions

<table>
<thead>
<tr>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>20. 0</td>
</tr>
<tr>
<td>21. 120</td>
</tr>
<tr>
<td>22. 20</td>
</tr>
<tr>
<td>23. 220</td>
</tr>
<tr>
<td>24. 50</td>
</tr>
<tr>
<td>25. (a) 1,000</td>
</tr>
<tr>
<td>(b) 50%</td>
</tr>
<tr>
<td>(c) 500</td>
</tr>
<tr>
<td>26. 400</td>
</tr>
<tr>
<td>27. 15,576</td>
</tr>
<tr>
<td>28. 11,014, which is the total profit for the dairy operation</td>
</tr>
</tbody>
</table>

Other activities:
Obtain copies of the latest NRC recommendations for dairy rations, and have students develop feeding programs for dairy cattle.

### Closure/Summary

Dairy production is a costly venture. Many production costs are associated with running a dairy operation, including the cost of the extensive facilities needed. Most producers market their milk through cooperatives, but the United States government controls the price of milk. Dairy producers need to be good managers to have a profitable operation.

### Evaluation: Quiz

<table>
<thead>
<tr>
<th>Answers:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. d</td>
</tr>
<tr>
<td>2. a</td>
</tr>
<tr>
<td>3. d</td>
</tr>
<tr>
<td>4. c</td>
</tr>
<tr>
<td>5. a</td>
</tr>
<tr>
<td>6. Eight weeks after calving</td>
</tr>
<tr>
<td>7. A total mixed ration is a mixture of all the feed ingredients needed by dairy cattle, including forages, grain, and supplements.</td>
</tr>
<tr>
<td>8. The cow’s nutritional needs are highest when lactation peaks.</td>
</tr>
<tr>
<td>9. Information on production levels and milk composition for each cow.</td>
</tr>
<tr>
<td>10. A management-intensive grazing system helps lower costs by reducing the costs associated with equipment for harvesting forages and purchased feeds.</td>
</tr>
</tbody>
</table>
Costs and Returns

Objective: Prepare a budget for a dairy operation.

Using the information provided, fill out the monthly worksheet for a dairy operation. Determine whether this operation had a profit or loss.

Returns:

The operation has sold 175,500 pounds of milk. The price per hundred pounds (cwt) was $14.00. The producer also received $2,200 from the sale of heifers.

Costs:

The value of the feeds consumed by the herd was $6,000 for concentrates, $300 for purchased forages, $250 for grain produced by the dairy operation, and $200 for hay. The average number of animals on pasture was 19, with a charge of $6. Hired labor cost $1,750. The family put in 290 hours on the operation, at a value of $6 an hour. Operator labor had a value of $1,400. Approximately 80% of the hours worked by the work force were spent on the dairy enterprise. Milk check deductions totaled $1,300, and $150 was spent on artificial insemination. Veterinary fees and medicine cost $600. Dairy supplies cost $500, and fuel cost $100. Utility bills totaled $200. Repairs on buildings cost the operation $195, while machinery repairs totaled $625. Farm insurance cost $120, and $20 was spent on professional fees. Expenses on vehicles totaled $220. Other expenses cost $50. Interest payments on the operation totaled $1,000, 50% of which went for the dairy enterprise. Annual depreciation for the operation is $4,800.

What is the total profit or loss for this dairy operation? _________________________________
# Monthly Worksheet

Name of farm: ___________________ Name of operator: ___________________ Month: __________

<table>
<thead>
<tr>
<th>Gross income</th>
<th>Your farm</th>
<th>Example farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. (a) Pounds of milk sold for the month (from your milk check)</td>
<td>181,903</td>
<td></td>
</tr>
<tr>
<td>2. Gross milk price ($ per hundredweight)</td>
<td>$12.50</td>
<td></td>
</tr>
<tr>
<td>3. Compute gross milk sales by multiplying 1(b) by step 2</td>
<td>22,738</td>
<td></td>
</tr>
<tr>
<td>4. Livestock sales related to dairy</td>
<td>3,000</td>
<td></td>
</tr>
<tr>
<td>5. Capital revolvements and other dairy income</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6. Add lines 3, 4 and 5 for total gross receipts</td>
<td>25,738</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Variable expenses</th>
<th>Your farm</th>
<th>Example farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>7. (a) Market value of purchased concentrates, alternative feeds, vitamins and minerals</td>
<td>6,250</td>
<td></td>
</tr>
<tr>
<td>8. Estimate the monthly value of pasture consumed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Average number of head on pasture for the month</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>(b) Monthly pasture charge</td>
<td>$5</td>
<td></td>
</tr>
<tr>
<td>(c) Multiply (a) by (b)</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>9. Total 7(a) through 7(e) and 8(c) to compute the total value of feedstuffs consumed</td>
<td>9,890</td>
<td></td>
</tr>
<tr>
<td>10. Estimate the true cost of labor for the dairy enterprise</td>
<td></td>
<td></td>
</tr>
<tr>
<td>(a) Amount spent for hired labor for the month (including benefits)</td>
<td>2,000</td>
<td></td>
</tr>
<tr>
<td>(b) Hours of unpaid family labor</td>
<td>330</td>
<td></td>
</tr>
<tr>
<td>(c) Value of family labor</td>
<td>$5</td>
<td></td>
</tr>
<tr>
<td>(d) Multiply (b) and (c)</td>
<td>1,650</td>
<td></td>
</tr>
<tr>
<td>(e) Value of your operator labor</td>
<td>200 hours x 8 = 1,600</td>
<td></td>
</tr>
<tr>
<td>(f) Portion of time the labor force was used on the dairy enterprise</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>(g) Add lines (a), (d) and (e) and multiply by (f)</td>
<td>5,250 x .75 = 3,938</td>
<td></td>
</tr>
<tr>
<td>11. Milk check deductions</td>
<td>1,764</td>
<td></td>
</tr>
<tr>
<td>12. Expenses for DHIA fees</td>
<td>200</td>
<td></td>
</tr>
<tr>
<td>13. Expenses for artificial insemination</td>
<td>283</td>
<td></td>
</tr>
<tr>
<td>14. Expenses for veterinary fees and medicine</td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>15. Expenses for dairy supplies; the portion of the following costs related to the dairy only</td>
<td>667</td>
<td></td>
</tr>
<tr>
<td>16. Expenses for fuel and oil</td>
<td>.3 x 299 = 90</td>
<td></td>
</tr>
<tr>
<td>17. Utility bills</td>
<td>.5 x 558 = 279</td>
<td></td>
</tr>
<tr>
<td>18. Building repairs</td>
<td>208</td>
<td></td>
</tr>
<tr>
<td>19. Machinery repairs</td>
<td>.3 x 1,050 = 347</td>
<td></td>
</tr>
<tr>
<td>20. Farm taxes</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>21. Farm insurance</td>
<td>.5 x 300 = 150</td>
<td></td>
</tr>
<tr>
<td>22. Any legal and professional fees</td>
<td>.5 x 42 = 21</td>
<td></td>
</tr>
<tr>
<td>23. Car and truck expenses</td>
<td>.5 x 333 = 167</td>
<td></td>
</tr>
<tr>
<td>24. Other expenses</td>
<td>100</td>
<td></td>
</tr>
<tr>
<td>25. (a) Interest payments</td>
<td>1,567</td>
<td></td>
</tr>
<tr>
<td>(b) Portion of the interest payment that went for the dairy enterprise</td>
<td>75%</td>
<td></td>
</tr>
<tr>
<td>(c) Multiply (a) by (b)</td>
<td>1,175</td>
<td></td>
</tr>
<tr>
<td>26. Get estimate for annual depreciation expenses of dairy enterprise. Divide this by figure 12</td>
<td>642</td>
<td></td>
</tr>
<tr>
<td>27. Estimate total operating expenses by adding steps 9, 10(g), 11 through 24, 25(c) and 26</td>
<td>20,419</td>
<td></td>
</tr>
<tr>
<td>28. Estimate income over operating expenses by subtracting step 27 from step 6</td>
<td>5,318</td>
<td></td>
</tr>
</tbody>
</table>

Source: *How to Compute Your Cost of Producing Milk* (G3651), University Extension agricultural publications, University of Missouri-Columbia
UNIT - INTRODUCTION TO DAIRY PRODUCTION Name ______________________

Lesson 4: Herd Management Date ______________________

EVALUATION

Circle the letter that corresponds to the best answer.

1. Which of the following facilities can have a herringbone design?
   a. Upright silo
   b. Stanchion barn
   c. Free stall barn
   d. Milking parlor

2. Who sets the base milk price paid to producers?
   a. Federal government
   b. Local cooperative
   c. National dairy producers
   d. State dairy producers

3. Roughages should make up what percentage of dairy rations?
   a. 70 percent
   b. 100 percent
   c. 10 percent
   d. 40 percent

4. How old should dairy heifers be when they calve for the first time?
   a. 36 months
   b. 20 months
   c. 24 months
   d. 30 months

5. What is the major daily cost of cattle production?
   a. Feed
   b. Facilities
   c. Labor
   d. Marketing fees
Complete the following short answer questions.

6. When does lactation peak in dairy cattle?

7. What is a total mixed ration?

8. When are a cow’s nutritional needs the highest?

9. What sort of information does the Dairy Herd Improvement Association record?

10. What is an advantage of using management-intensive grazing in a dairy operation?
Course: Agricultural Science I
Unit: Introduction to Dairy Production
Lesson: Herd Health
Estimated Time: 90 minutes or two 50-minute blocks

Student Outcome
Develop a herd health program.

Learning Objectives
1. Describe the common herd health problems in lactating dairy animals.
2. Explain how mastitis is prevented and controlled.
3. Describe the common herd health problems in raising replacement heifers.
4. Explain how medications are administered.

Grade Level Expectations

Resources, Supplies & Equipment, and Supplemental Information

Resources
1. PowerPoint Slides
   Ppt 1 - Health Problems in Lactating Dairy Animals
   Ppt 2 - Routes of Administration
2. Activity Sheet
   AS 1 - California Mastitis Test (CMT)
3. Introduction to Dairy Production (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1997.

Supplies & Equipment
- Mastitis-infected milk sample from local dairy producer
- Store-bought milk sample
- Materials for California Mastitis Test (CMT)

Supplemental Information
1. Internet Sites

Print


**Interest Approach**

Obtain a mastitis-infected milk sample from a local dairy producer and a sample of store-bought milk. Have students describe the differences and their impressions of the two milk samples.

**Communicate the Learning Objectives**

1. Describe the common herd health problems in lactating dairy animals.
2. Explain how mastitis is prevented and controlled.
3. Describe the common herd health problems in raising replacement heifers.
4. Explain how medications are administered.

<table>
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<tbody>
<tr>
<td><strong>Objective 1</strong></td>
<td>Describe the common herd health problems in lactating dairy animals.</td>
</tr>
</tbody>
</table>

*Ask students what the common herd health concerns in lactating dairy cattle are. Use PPT 1 as a guide for discussion.*

- **Milk fever**
  1. Results from a calcium imbalance and involves abnormally low levels of calcium in the blood
  2. Causes loss of appetite, staggering, and paralysis; can cause death if untreated
  3. Treated with an intravenous injection of calcium by a veterinarian
  4. Prevented by feeding dry cows rations with correct levels of calcium and phosphorus

- **Ketosis**
  1. Results from underfeeding during the period of high lactation shortly after calving
  2. Causes reduced milk production, weight loss, and a fruity odor to the breath and milk
  3. Treated with injections of glucose or hormones
  4. Prevented by feeding high energy diets to lactating dairy cattle

- **Foot rot**
  1. Caused by a wound between the toes
  2. Causes lameness, swelling, fever, decreased appetite, and a sharp decrease in milk production
  3. Treated with foot baths and antibiotics

- **Hairy heel warts**
  1. Causes an extremely painful growth on the skin on the heels of the rear feet
  2. May cause animals to avoid putting weight on their
### Instructor Directions

<table>
<thead>
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<tbody>
<tr>
<td>heels; also associated with decreased milk production</td>
</tr>
<tr>
<td>3. May be treated with the use of antibiotic sprays on the affected area</td>
</tr>
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</table>

#### Laminitis

1. Caused by high concentrate levels combined with insufficient levels of long fiber from forages for adequate cud chewing, which creates acidic conditions in the rumen
2. Causes lameness and poor milking performance
3. Can be prevented by careful management of feeding; may also require aggressive foot trimming

#### Mastitis

1. Causes the greatest economic losses
2. Caused by bacteria entering the udder through the teat or an injury to the cow’s udder
3. Clinical or acute mastitis—causes a severely swollen udder, bloody or clotted milk, loss of appetite, and severe reduction in milk production
4. Subclinical or chronic mastitis—causes decreased milk production and an elevated somatic cell count, although the milk appears to be normal to the herd manager

### Objective 2

**Ask the class to list ways to prevent and control mastitis.**
*Emphasize the fact that mastitis is the single biggest dairy health problem. Have students complete the California Mastitis Test on AS 1.*

**AS 1 – California Mastitis Test (CMT)**

### Explain how mastitis is prevented and controlled.

#### Prevention

1. **Proper sanitation**
   - a. Milking equipment must be sanitary to keep cows from being infected by milking units.
   - b. Before milking, milkers should strip the teats, removing a small amount of milk that is higher in bacteria.
   - c. They should then wash and dry the teats before attaching the milking units.
   - d. After milking, they should dip the teats in an acceptable disinfectant.
   - e. Milkers may also predip the teats before milking instead of washing them.
2. **Testing for subclinical mastitis**
   - a. Producers should give tests at least once every month to detect the high somatic cell counts caused by subclinical mastitis.
### Instructor Directions

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<th>Content Outline</th>
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<tbody>
<tr>
<td>b.</td>
<td>Producers can administer the California Mastitis Test.</td>
</tr>
<tr>
<td>c.</td>
<td>Laboratory tests can be used to determine somatic cell counts more accurately.</td>
</tr>
<tr>
<td>3.</td>
<td>Prevention of infections during the dry period—Producers treat the cow’s mammary glands with long-lasting antibiotics that will combat infections that may be present and prevent mastitis.</td>
</tr>
</tbody>
</table>

**Treatment**

1. One treatment is frequent milking of the cow; the toxins causing the infection can be milked out with repeated milkings.
2. Some producers give cows an injection of oxytocin, which is a naturally occurring hormone causing milk secretion; the additional oxytocin allows the cow to be more completely milked out with a normal milking routine.
3. They may also give cows antibiotics to treat mastitis; however, they must discard the milk from cows treated with most antibiotics.

### Objective 3

Ask students what the common health problems in raising replacement heifers are. Write suggestions on the board or overhead.

Describe the common herd health problems in raising replacement heifers.

Diarrhea, or scours, is the biggest health concern; it causes dehydration if not treated properly.

**Brucellosis**

1. Brucellosis causes abortions, sterility, and reduced milk production.
2. Heifers should be vaccinated at four to seven months of age.

**Leptospirosis**

1. Leptospirosis causes abortions.
2. Heifers should be vaccinated against leptospirosis and other reproductive diseases before breeding.

**Other diseases**

1. Bovine rhinotracheitis (IBR)
2. Pasteurella (PI3)
3. Bovine viral diarrhea (BVD)
4. Blackleg
<table>
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<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
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</thead>
<tbody>
<tr>
<td>5. Heifers should be vaccinated between weaning and eight months of age, with boosters given as appropriate.</td>
<td></td>
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</tbody>
</table>

**Objective 4**

*Ask students to describe how medications should be administered to dairy cattle. Use Ppt 2 to illustrate different routes of administration.*

- Ppt 2 – Routes of Administration

**Explain how medications are administered.**

1. Intramuscular (IM) — administered into the muscle; should be given in the neck
2. Subcutaneous (Sub-Q) — administered between the skin and muscle; should be given in the loose skin on the side of the neck
3. Oral — given by mouth
4. Intranasal (IN) — given as a nasal spray
5. Intravenous (IV) — given directly into the jugular vein

**Application:**

- AS 1 – California Mastitis Test (CMT)

Answers to AS 1

Scores should be based on student participation.

Other activities:

1. Conduct a research project with a local dairy producer on the incidence of mastitis in his or her herd and the control measures used to prevent it.
2. Profile various medications used in beef and dairy cattle. Note the restrictions for lactating and nonlactating cows.

**Closure/Summary**

Dairy producers must be able to detect and treat herd health problems. Mastitis is the most serious dairy herd health problem. Other diseases that affect lactating cows are milk fever and ketosis. Replacement heifers also have specific health concerns. Medicines must be used correctly when treating these diseases.

**Evaluation: Quiz**

Answers:

1. b
2. b
3. a
4. c
5. d
6. b
7. Subcutaneous injections should be given between the skin and muscle in the loose skin on the side of the neck.
8. The symptoms of subclinical mastitis are decreased
<table>
<thead>
<tr>
<th>Instructor Directions</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>milk production and an elevated somatic cell count.</td>
</tr>
</tbody>
</table>
California Mastitis Test (CMT)

Objective: Use the California Mastitis Test.

Materials and Equipment:
Test paddle
Reagent
Store-bought milk sample
Milk sample from a local dairy cow with mastitis

Procedure:
1. Place approximately half a teaspoon of each of the milk samples into the test paddle.
2. Add half a teaspoon of test reagent to each sample (Figure 1.1).
3. Gently rotate the paddle to mix the milk and reagent.
4. Ten to fifteen seconds after mixing, look for changes in color and consistency. Samples from infected cows will be a deep purple in color. Uninfected milk will remain liquid, while infected milk that reacts strongly will clump together in a gel (Figure 1.2). The milk forms small masses of gel in a moderate reaction.

Figure 1.1 - Test Paddle and Reagent
Figure 1.2 - Normal Milk Versus Strong Reaction
EVALUATION

Circle the letter that corresponds to the best answer.

1. Which dairy herd health problem causes the greatest economic losses?
   a. Scours
   b. Mastitis
   c. Ketosis
   d. Milk fever

2. What is one factor in preventing mastitis?
   a. Antibiotic usage
   b. Proper sanitation
   c. Proper equipment design
   d. Good selection

3. What is the biggest health concern when raising replacements?
   a. Scours
   b. Brucellosis
   c. Leptospirosis
   d. Ketosis

4. When should replacement heifers be vaccinated for brucellosis?
   a. One to two months of age
   b. Three to eight months of age
   c. Four to seven months of age
   d. One year of age

5. Of what disease is a fruity odor to milk a symptom?
   a. Mastitis
   b. Leptospirosis
   c. Milk fever
   d. Ketosis
6. How often should producers test the herd for subclinical mastitis?
   
   a. At least once a week  
   b. At least once a month  
   c. At least once every six months  
   d. At least once a year  

   **Complete the following short answer questions.**

7. Where should a subcutaneous injection be given?

8. What are the symptoms of subclinical mastitis?
Course: Agricultural Science I  
Unit: Introduction to Dairy Production  
Lesson: Industry Issues  
Estimated Time: 180 minutes (class and debate)

Student Outcome
Evaluate issues concerning the dairy industry.

Learning Objectives
1. Discuss some concerns consumers have about the dairy industry.
2. Explain how the dairy industry is addressing consumer concerns.
3. Explain how the consumer knows that he or she has a safe food product.

Grade Level Expectations

Resources, Supplies & Equipment, and Supplemental Information

Resources
1. Activity Sheet
   - AS 1 - Debate—Animal Welfare
2. Introduction to Animal Nutrition (Student Reference). University of Missouri-Columbia: Instructional Materials Laboratory, 1996.

Supplies & Equipment
- Store-bought milk sample

Supplemental Information
1. Internet Sites

2. Print
## Interest Approach

Bring in a store-bought milk sample. Ask the students whether they think the milk is safe. Discuss the possibility of medications ending up in the fluid milk supply.

## Communicate the Learning Objectives

1. Discuss some concerns consumers have about the dairy industry.
2. Explain how the dairy industry is addressing consumer concerns.
3. Explain how the consumer knows that he or she has a safe food product.

<table>
<thead>
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<tbody>
<tr>
<td><strong>Objective 1</strong></td>
<td>Discuss some concerns consumers have about the dairy industry.</td>
</tr>
</tbody>
</table>
| *Ask students what concerns consumers have about dairy production. Discuss why consumers might be concerned about these things.* | 1. Waste management—contamination of ground and surface water by improperly handled, untreated waste
2. Drug usage in lactating cows—presence of drugs given to lactating cows in fluid milk, which may be harmful to humans
3. Animal welfare—how management practices affect animal comfort and well-being; for example, that cows and calves do not have sufficient freedom to move around and that they may not always be adequately supplied with shade and shelter |
| **Objective 2**       | Explain how the dairy industry is addressing consumer concerns. |
| *Ask the class what dairy producers are doing to address consumer concerns. Have students carry out the debate outlined in AS 1. Divide the class into two groups and allow the groups to research the subject to prepare for the debate. Moderate the debate for the class.* | Waste management—education by the industry concerning waste storage, management, and land application
Drug usage—Milk and Dairy Beef Quality Assurance programs
1. Programs educating producers about management practices that can help them produce high quality milk and pure beef products
2. Focus on several points that can help producers improve their milk, including proper herd health management, sanitation, feeding, and record keeping
Animal welfare—information by dairy-related agencies to educate producers about management practices that will ensure animal welfare |

🔗 [AS 1 - Debate — Animal Welfare](#)
<table>
<thead>
<tr>
<th>Instructor Directions</th>
<th>Content Outline</th>
</tr>
</thead>
<tbody>
<tr>
<td>Objective 3</td>
<td>Explain how the consumer knows that he or she has a safe food product.</td>
</tr>
</tbody>
</table>

Ask the class how they know that the food supply, especially dairy products, is safe.

Consumers can be sure that dairy products are safe because of inspections by the USDA and state regulatory agencies.

1. State inspections are carried out to look at factors such as drug usage and sanitation in the milking parlor.
2. Milk samples are tested for contaminants at both the farm and the processing plant to confirm that the milk is safe.
3. Milk unfit for human use is added to animal feeds or dumped.

Application:

- AS 1 - Debate—Animal Welfare

Answers to AS 1
Students should be graded on their participation and the quality of the research for the debate.

Closure/Summary

Dairy producers must be aware of the public’s perception of current dairy practices. Producers should educate themselves and consumers about the safety of dairy products and the management practices used in American dairy production.

Evaluation: Quiz

Answers:
1. d
2. c
3. Milk that is unfit for human consumption is used in animal feeds or dumped.
4. They are designed to educate producers about management practices that can help them produce high quality milk and pure beef products.
5. Consumers worry that cows and calves do not have sufficient freedom to move around and that they may not always be adequately supplied with shade and shelter.
Objective: Explore issues surrounding dairy production.

Your class will be conducting a debate about the welfare of dairy cattle. Your instructor will assign you to a group to argue for or against the management practices used in dairy production. Use any available resources to find information that supports your argument. Your research should answer the following questions. You should bring up any other relevant points you discover in your research during the debate.

- Should calves be separated from cows soon after calving?
- Should calves be raised individually rather than in groups?
- Are calves given enough space to move around when they are placed in individual pens?
- Do cows have enough freedom to move around in barns?

When you have completed researching your position, your instructor will moderate the debate.
UNIT - INTRODUCTION TO DAIRY PRODUCTION Name ________________________

Lesson 6: Industry Issues                Date ________________________

EVALUATION

Circle the letter that corresponds to the best answer.

1. What federal agency is responsible for inspecting milk in the United States?
   a. Federal Trade Commission  
   b. Missouri Department of Agriculture  
   c. Food and Drug Administration  
   d. United States Department of Agriculture

2. What is the chief concern connected to management of wastes from dairy operations?
   a. Odor from dairy operations  
   b. Contamination of milk with drug residues  
   c. Contamination of ground and surface water  
   d. The effect on animals of large-scale confinement operations

Complete the following short answer questions.

3. What happens to milk that is unfit for human consumption?

4. What are the Milk and Dairy Beef Quality Assurance programs designed to do?

5. What are two things that consumers worry about concerning the welfare of dairy animals?