

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:

Hoard's Dairyman. Accessed April 3, 2003, from <http://www.hoards.com/>.

Introduction to Dairy Production. University of Missouri-Columbia, Instructional Materials Laboratory, 1997.

NASCO On-Line Catalogs. Accessed April 3, 2003, from <http://www.enasco.com/prod/Home>.

Steevens, B., Ricketts, R. E., Rook, J., & Ruchlow, R. *Before You Go Into Dairying*. University of Missouri-Columbia Extension. Accessed March 3, 2003, from <http://muextension.missouri.edu/explore/agguides/dairy/g03500.htm>.

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

Name _____

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

◆ Page 7 ◆

Final Assessment Total _____/100 pts.

Comments:

Course	Agricultural Science I
Unit	Introduction to Dairy Production
Lesson	Introduction to the Dairy Industry
Estimated Time	50 minutes

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.
3. *Introduction to Dairy Production Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

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

Supplemental Information

1. Internet Sites
 - Dairy Industry: Milk Production and Dairy Farms. eMints National Center. Accessed August 30, 2007, from <http://www.emints.org/ethemes/resources/S00000466.shtml>.
 - Dairy Publications. MU Extension. University of Missouri-Columbia. Accessed April 12, 2007, from <http://extension.missouri.edu/explore/agguides/dairy/>.
 - Employment in the Dairy Industry. Burra Foods Factory Tour. Accessed August 30, 2007, from <http://www.burrafoods.com.au/tour/burrawork.htm>.
 - Kenealy, M. D. *A Future in the Dairy Industry: The Career Market for Students Trained in Dairy Science*. Accessed August 30, 2007, from <http://www.extension.iastate.edu/Pages/dairy/report95/teaching/dsl-05.pdf>.
 - LaDue, E., B. Gloy, and C. Cuykendall. *Future Structure of the Dairy Industry: Historical Trends, Projections and Issues*. Accessed August 30, 2007, from <http://www.aem.cornell.edu/research/researchpdf/rb0301.pdf>.

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- ❑ Missouri Dairymen's Resource Guide. MU Extension. University of Missouri-Columbia. Accessed August 30, 2007, from <http://agebb.missouri.edu/dairy/>.
2. Print
- ❑ Pond, K. and W. Pond. *Introduction to Animal Science*. New York: John Wiley & Sons, Inc., 2000.
 - ❑ Schwarzweller, H. K., and A. P. Davidson, eds. *Dairy Industry Restructuring: Research in Rural Sociology and Development*. New York: JAI Press, 2000.
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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
<ol style="list-style-type: none"> 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	Content Outline
<p>Objective 1</p> <p><i>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.</i></p>	<p>Describe the economic importance of the dairy industry in Missouri.</p> <ol style="list-style-type: none"> 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.
<p>Objective 2</p> <p><i>Ask how the dairy industry has evolved in the United States. Compare dairies of today with those in the nineteenth century.</i></p>	<p>Explain how the dairy industry has evolved.</p> <p>The dairy industry began when settlers brought cows to America in the early 1600s.</p> <p>Until the mid-nineteenth century, the owner of the cow consumed most of its milk; some milk and dairy products were sold to those nearby who did not have their own cows.</p> <p>In the nineteenth century, technological advancements</p>

Instructor Directions	Content Outline
	<p>led to the growth of the dairy industry.</p> <ol style="list-style-type: none"> 1. Refrigerated railroad cars for transport to urban areas. 2. Pasteurization of milk 3. Commercially produced cheese <p>These advances allowed dairy production to become a commercial business, with dairy operations supplying milk to many people.</p>
<p>Objective 3</p> <p><i>Ask how dairy operations are changing. Discuss the differences between past and current dairy trends.</i></p>	<p>Identify modern trends in the dairy industry.</p> <ol style="list-style-type: none"> 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)
<p>Objective 4</p> <p><i>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.</i></p>	<p>Identify career opportunities available in the dairy industry.</p> <ol style="list-style-type: none"> 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
<p>Application:</p> <p> AS 1 - A Career in the Dairy Industry</p>	<p>Answers to AS 1 Answers will vary.</p> <p>Other activities: Schedule a guest speaker who is actively involved in the dairy industry to discuss careers and the future of the industry.</p>
<p>Closure/Summary</p>	<p>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</p>

Instructor Directions	Content Outline
	<p>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.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ol style="list-style-type: none"> 1. c 2. d 3. c 4. Refrigerated railroad cars allowed producers to ship their milk long distances to urban areas. Milk began to be pasteurized. Commercially manufactured cheese became available. 5. 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.

Lesson 1: Introduction to the Dairy Industry Name _____

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.

Course	Agricultural Science I
Unit	Introduction to Dairy Production
Lesson	Breeds of Dairy Cattle
Estimated Time	50 minutes

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.
4. *Introduction to Dairy Production Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Photos of a red and white Holstein or Ayrshire

Supplemental Information

1. Internet Sites
 - Dairy Cattle Breed Associations. National Association of Animal Breeders. Accessed August 30, 2007, from <http://www.naab-css.org/guidelines/dairybrd.html>.
 - North American Dairy Breeds. Oklahoma State University. Accessed August 30, 2007, from <http://www.ansi.okstate.edu/breeds/cattle/nadairy.htm>.
2. Print
 - Felius, M. *Cattle Breeds: An Encyclopedia*. Chicago, IL: Trafalgar Square Books, 2007.
 - Pukite, J. *A Field Guide to Cows: How to Identify and Appreciate America's 52 Breeds*. New York: Penguin Group, 1998.
 - Thomas, H. S. *Getting Started with Beef and Dairy Cattle*. North Adams, MA: Storey Publishing, LLC, 2005.

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.

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.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>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.</i></p> <p> PPT 1 - Dairy Breeds</p> <p> AS 1 - Dairy Breeds</p> <p> AS 2 - Researching Dairy Breeds</p>	<p>Describe the identifying characteristics and histories of the six major dairy breeds in Missouri.</p> <p>Ayrshire</p> <ol style="list-style-type: none">1. Red and white2. Excellent grazers with high quality udders3. Not used extensively in the dairy industry because of their comparatively low milk production4. Imported from Scotland in the early nineteenth century <p>Brown Swiss</p> <ol style="list-style-type: none">1. Light to dark brown with black noses and tongues2. Large in size3. Rank second to Holsteins in average pounds of milk produced per animal4. Heat-tolerant breed often used in tropical areas of the world5. Used as a dual purpose breed for milk and beef production6. Imported from Switzerland in 1869 <p>Guernsey</p> <ol style="list-style-type: none">1. Pale yellow and white2. Golden color to milk due to high levels of beta-carotene, a source of vitamin A3. Second to Jerseys in the percentage of fat and protein in milk4. Imported from the Isle of Guernsey in the early 1800s <p>Holstein</p> <ol style="list-style-type: none">1. Most popular dairy breed2. Black and white; occasionally red and white3. Largest of the dairy breeds in size

Instructor Directions	Content Outline
	<p>4. Rank first in the average pounds of milk produced per animal</p> <p>5. Imported from the Netherlands in the early seventeenth century</p> <p>Jersey</p> <ol style="list-style-type: none"> 1. Fawn, light brown, gray, or almost black 2. Smallest in size 3. Produce milk that has the highest percentage of milk fat and milk protein 4. More tolerant of heat stress than Holsteins 5. Imported from the Isle of Jersey in the early nineteenth century <p>Milking Shorthorn</p> <ol style="list-style-type: none"> 1. Red, white, or any combination of the two 2. Dual purpose breed used for both beef and milk production 3. Recognized as a breed in the 1940s 4. Originated in England
<p>Objective 2</p> <p><i>Ask students to describe how a breed is selected. Make sure students focus on the goals of the individual producer.</i></p>	<p>Explain the factors that influence breed selection.</p> <ol style="list-style-type: none"> 1. Breed selection depends on the goals of the producer. 2. The primary goal of most producers is to maximize milk production, which is why Holsteins are the most popular dairy breed. 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).
<p>Application:</p> <p> AS 1 - Dairy Breeds</p> <p> AS 2 - Researching Dairy Breeds</p>	<p>Answers to AS 1 See the content for Objective 1.</p> <p>Answers to AS 2 Results will vary.</p> <p>Other activities: Have students search the Internet for information on different breeds. Oklahoma State University has a Web site (http://www.ansi.okstate.edu/breeds/) that covers many breeds of livestock, including dairy cattle.</p>
<p>Closure/Summary</p>	<p>The major dairy breeds are Ayrshire, Brown Swiss,</p>

Instructor Directions	Content Outline
	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.
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. d 2. f 3. e 4. a 5. f 6. b 7. c 8. b 9. d 10. The primary goal of most producers is to maximize milk production.

Lesson 2: Breeds of Dairy Cattle

Name _____

Dairy Breeds**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.**

Breed Name	Color	When Imported	Origin	Notable Characteristics
Ayrshire				
Brown Swiss				
Guernsey				
Holstein				
Jersey				
Milking Shorthorn				

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 2: Breeds of Dairy Cattle

Date _____

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 | f. Holstein |
| 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?

Course	Agricultural Science I
Unit	Introduction to Dairy Production
Lesson	Principles of Dairy Cattle Selection
Estimated Time	50 minutes

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.
4. *Introduction to Dairy Production Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Four to six pictures of dairy cows

Supplemental Information

1. Internet Sites
 - Linear Descriptive Traits*. Holstein Association. Accessed August 30, 2007, from <http://www.holsteinusa.com/pdf/f2224.pdf>.
 - Parts of the True Type Cow. Holstein Canada. Accessed August 30, 2007, from <http://www.holstein.ca/english/Breed/parts.asp>.
2. Print
 - Tyler, H., and M.E. Ensminger. *Dairy Cattle Science*. 4th Ed. Upper Saddle River, NJ: Prentice Hall, 2005.

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.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>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.</i></p> <p> Ppt 1 - Parts of a Dairy Cow</p> <p> AS 1 - Parts of a Dairy Cow</p>	<p>Identify the parts of a dairy cow.</p> <ol style="list-style-type: none">1. Face2. Muzzle3. Jaw4. Neck5. Throat6. Dewlap7. Brisket8. Floor of the chest9. Barrel10. Milk wells11. Mammary veins12. Fore udder attachment13. Ribs14. Teat15. Pastern16. Hoof17. Dewclaw18. Switch19. Hock20. Rear flank21. Thigh22. Pin Bones23. Tail head24. Thurl25. Hooks26. Withers27. Heart girth28. Poll29. Rump30. Loin31. Chine

Instructor Directions	Content Outline
	32. Back
<p>Objective 2</p> <p><i>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.</i></p> <p><input type="checkbox"/> PPT 2 - Dairy Cow Unified Score Card</p>	<p>Describe how the Dairy Cow Unified Score Card is used in the classification of dairy cattle.</p> <p>Cows are compared to an ideal cow (which is assigned a score of 100 points) and classified according to their scores.</p> <ol style="list-style-type: none"> 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 <p>The score card looks at five major traits.</p> <ol style="list-style-type: none"> 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 <ol style="list-style-type: none"> a. Most important part of the dairy cow b. Evaluation for milk production and productivity over time
<p>Objective 3</p> <p><i>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.</i></p>	<p>Explain how linear evaluation is used in dairy herd improvement.</p> <p>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.</p> <p>Seventeen linear traits are used in evaluating cows, with traits assigned a numerical score between one and fifty.</p> <ol style="list-style-type: none"> 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	Content Outline
	<ol style="list-style-type: none"> 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 <p>Producers can pinpoint specific traits in cows that should be improved and then select bulls for breeding.</p> <p>They can also evaluate and select bulls for breeding by using their daughters' scores.</p>
<p>Application:</p> <p> AS 1 - Parts of a Dairy Cow</p>	<p>Answers to AS 1</p> <ol style="list-style-type: none"> 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. Rear udder attachment 23. Tail 24. Pin bones 25. Tail head 26. Thurl

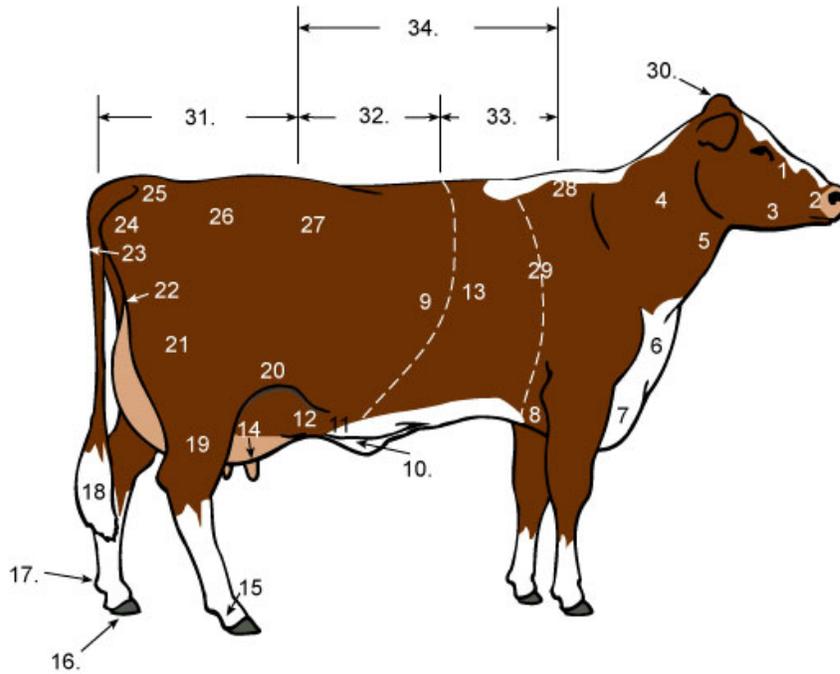
Instructor Directions	Content Outline
<p>AS 2 - Linear Evaluation</p>	<p>27. Hooks 28. Withers 29. Heart girth 30. Poll 31. Rump 32. Loin 33. Chine 34. Back</p> <p>Answers to AS 2</p> <ol style="list-style-type: none"> The cow is fine for fifteen of the seventeen traits. However, udder depth (UD) is 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. 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.
<p>Closure/Summary</p>	<p>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.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ol style="list-style-type: none"> b g d c i e f j h a c d b 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

Instructor Directions	Content Outline
	<p>udder attachment, rear udder height, rear udder width, udder cleft, udder depth, front teat placement, teat length, rear legs (rear view), or udder tilt.</p> <p>15. Producers use the information from linear evaluation to improve the functional type of the dairy herd by selecting animals for breeding.</p>

Parts of a Dairy Cow

Objective: Identify the parts of a dairy cow.

Write the names of the parts of a dairy cow in the numbered blanks.



- | | | |
|-----------|-----------|-----------|
| 1. _____ | 13. _____ | 25. _____ |
| 2. _____ | 14. _____ | 26. _____ |
| 3. _____ | 15. _____ | 27. _____ |
| 4. _____ | 16. _____ | 28. _____ |
| 5. _____ | 17. _____ | 29. _____ |
| 6. _____ | 18. _____ | 30. _____ |
| 7. _____ | 19. _____ | 31. _____ |
| 8. _____ | 20. _____ | 32. _____ |
| 9. _____ | 21. _____ | 33. _____ |
| 10. _____ | 22. _____ | 34. _____ |
| 11. _____ | 23. _____ | |
| 12. _____ | 24. _____ | |

Linear Evaluation

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

Stature (ST)	1-5	Extremely short
	25	Intermediate
	45-50	Extremely tall*
Strength (SR)	1-5	Extremely narrow and frail
	25	Intermediate
	45-50	Extremely strong and wide*
Body Depth (BD)	1-5	Extremely shallow body
	25	Intermediate
	45-50	Extremely deep body*
Dairy Form (DF)	1-5	Extremely tight
	25	Intermediate*
	45-50	Extremely open
Rump Angle (RA)	1-5	Pins clearly higher than hooks
	25	Slight slope from hooks to pins*
	45-50	Extremely sloped from hooks to pins
Rump Width (RW)	1	Extremely narrow
	25	Intermediate
	50	Extremely wide*
Rear Legs - side view (LS)	1-5	Posty and straight
	25	Intermediate set*
	45-50	Extremely sickled
Foot Angle (FA)	1-5	Extremely low angle
	25	Intermediate*
	45-50	Extremely steep

Fore Udder Attachment (FU)	1-5 Extremely loose 25 Intermediate strength 45-50 Extremely snug and strong*
Rear Udder Height (UH)	1-5 Extremely low 25 Intermediate height 45-50 Extremely high*
Rear Udder Width (UW)	1-5 Narrow rear udder 25 Intermediate 45-50 Extremely wide rear udder*
Udder Cleft (UC)	1-5 Weak cleft 25 Intermediate 45-50 Extremely strong cleft*
Udder Depth (UD)	1-5 Very deep udder floor below hocks 25 Intermediate* 45-50 Extremely high
Front Teat Placement (TP)	1-5 Extremely wide on outside of quarters 25 Centrally placed* 45-50 Base of teats on inside of quarters
Teat Length (TL)	1-5 1-1/4 inches or smaller 25 2-1/4 inches* 45-50 3-1/4 inches or longer
Rear Legs - rear view (RL)	1-5 Severe toe out 45-50 No toe out*
Udder Tilt (UT)	1-5 Rear quarters deep 25 Front and rear quarters level* 45-50 Front quarters deep

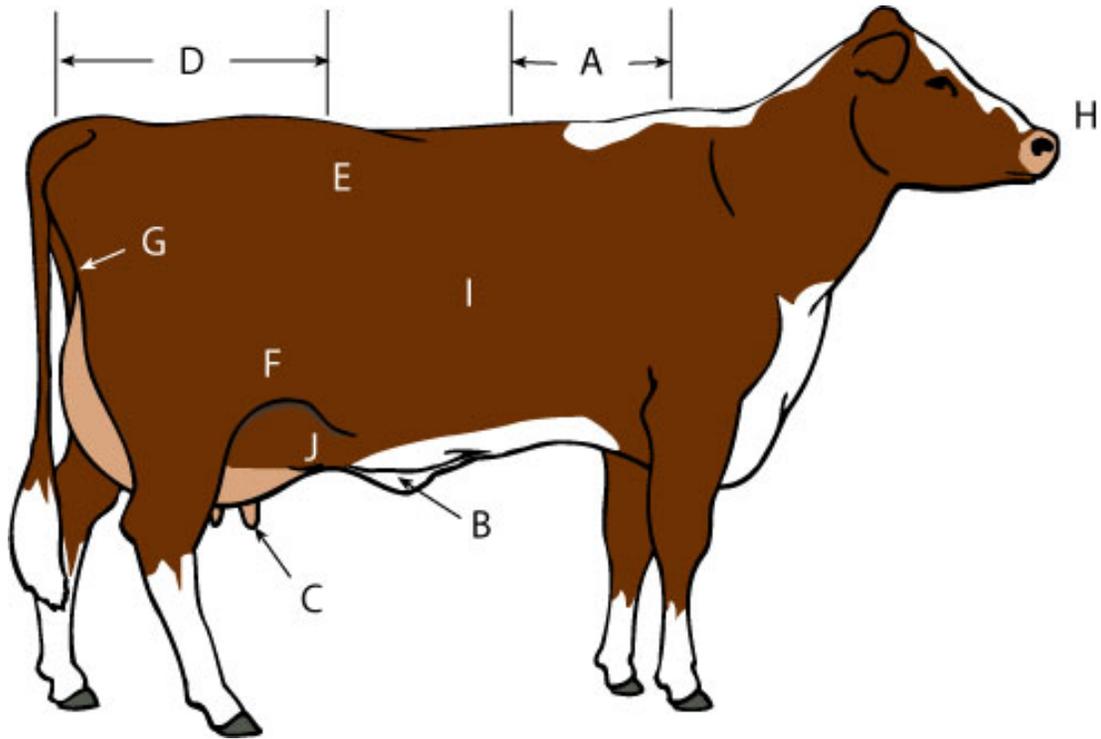
1. Cow 1

ST	46	UH	43
SR	43	UW	45
BD	49	UC	46
DF	22	UD	15
RA	29	TP	7
RW	48	TL	27
LS	21	RL	46
FA	22	UT	30
FU	47		

2. Cow 2

ST	25	UH	45
SR	46	UW	45
BD	44	UC	1
DF	25	UD	25
RA	43	TP	25
RW	48	TL	25
LS	25	RL	48
FA	25	UT	30
FU	43		

EVALUATION



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?

Course	Agricultural Science I
Unit	Introduction to Dairy Production
Lesson	Herd Management
Estimated Time	Two 90-minute blocks or four 50-minute blocks

Student Outcome

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.
4. *Introduction to Dairy Production Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Empty gallon milk jug

Supplemental Information

1. Internet Sites
 - Center for Dairy Profitability. University of Wisconsin. Accessed August 30, 2007, from <http://cdp.wisc.edu/Welcome.htm>.
 - Dairy Publications. MU Extension. University of Missouri-Columbia. Accessed April 12, 2007, from <http://extension.missouri.edu/explore/agguides/dairy/>.
 - Livestock and Forages Publications. Division of Agriculture, University of Arkansas. Accessed August 30, 2007, from <http://www.aragriculture.org/livestock/publications.htm#Dairy>.
 - National Dairy Herd Information Association. Accessed August 30, 2007, from

<http://www.dhia.org/>.

2. Print

- ❑ Kellems, R. O., and D. C. Church. *Livestock Feeds and Feeding*. 5th ed. Upper Saddle River, NJ: Prentice Hall, 2001.
- ❑ National Research Council. *Nutrient Requirements of Dairy Cattle*. 7th ed. Washington, D.C.: National Academy Press, 2001.
- ❑ Peters, A., and P. J. H. Ball, *Reproduction in Cattle*. 3rd ed. Blackwell Publishing Limited, 2004.
- ❑ Thomas, H. S. *Getting Started with Beef and Dairy Cattle*. North Adams, MA: Storey Publishing, LLC, 2005.

3. Electronic Media

- ❑ *Animal Nutrition Interactive PowerPoints*. University of Missouri-Columbia: Instructional Materials Laboratory, 2006.
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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.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>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.</i></p> <p> AS 1 - Costs and Returns</p>	<p>Identify the production costs for operating a dairy.</p> <ol style="list-style-type: none">1. Facilities2. Feed – major cost on a daily basis3. Labor4. Marketing fees5. Fees for milk testing6. Veterinary fees and medicines7. Building repair and maintenance
<p>Objective 2</p> <p><i>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.</i></p>	<p>Describe the facility requirements for dairy production.</p> <p>Milking parlors</p> <ol style="list-style-type: none">1. Milking parlors are required for modern dairies that produce Grade A milk.2. Designs<ol style="list-style-type: none">a. Parallel<ul style="list-style-type: none">-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<ul style="list-style-type: none">-Cows stand at an angle on both sides of the pit.

Instructor Directions	Content Outline
	<p>-The design allows easy access to each cow's udder from the side for putting on and removing the milking units.</p> <p>Free stall or stanchion barns</p> <ol style="list-style-type: none"> 1. In free stall barns, cows move freely between the separate stalls. 2. In stanchion barns, a headgate or a chain and collar confines cows to their stalls. <p>Feed storage</p> <ol style="list-style-type: none"> 1. Upright silos and pit silos hold corn silage and haylage. 2. Grain and bulk bins hold prepared feed or supplements. <p>Waste storage</p> <ol style="list-style-type: none"> 1. Lagoons are artificial waste holding areas that resemble ponds. 2. A watertight concrete or coated steel tank may also be used for manure storage; tanks may be above or below ground. <p>Heifer development facilities</p> <ol style="list-style-type: none"> 1. Calves are kept individually in hutches until weaning. 2. They are then moved to group pens.
<p>Objective 3</p> <p><i>Ask students what should be considered when raising replacement heifers. For specific feeding programs, consult National Research Council (NRC) recommendations.</i></p>	<p>Describe the factors that must be considered in raising replacement heifers.</p> <p>Dairy producers should consider the number of females needed each year as well as proper development.</p> <p>Heifers should be ready to calve at 24 months of age and weigh 1,000 to 1,300 pounds, depending on the breed.</p> <p>Careful feeding is essential if heifers are to reach this weight at the right time for breeding.</p> <ol style="list-style-type: none"> 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.
<p>Objective 4</p>	<p>Explain the factors to consider in reproductive management.</p>

Instructor Directions	Content Outline
<p><i>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.</i></p> <p>☐ PPT 1 - Lactation Curve of the Dairy Cow</p>	<p>Cows must become pregnant and calve for lactation to begin.</p> <p>Lactation usually peaks at eight weeks after calving and then slowly declines.</p> <p>Cows should be rebred 40 to 100 days after calving to maintain the cycle of milk production.</p> <p>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.</p> <p>The dry period should last 40 to 70 days, with an average of 60 days.</p> <p>Most dairy cows are artificially inseminated.</p> <ol style="list-style-type: none"> 1. Permits the dairy producer to use bulls that are genetically superior 2. Helps in controlling the spread of reproductive diseases 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 4. Also used because of the problems associated with keeping a dairy bull on the farm, since dairy bulls are often very aggressive <p>Some producers use embryo transfer to increase the spread of superior genetics in the herd.</p>
<p>Objective 5</p> <p><i>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.</i></p>	<p>Describe the nutritional requirements for dairy cattle.</p> <ol style="list-style-type: none"> 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

Instructor Directions	Content Outline
	<p>rumen.</p> <p>5. The cow's production level and body condition determine the exact nutrient needs of the cow.</p>
<p>Objective 6</p> <p><i>Discuss the different feeding methods that can be used to meet the nutritional needs of dairy cows.</i></p>	<p>Explain the feeding methods for dairy cattle.</p> <p>Traditional feeding method</p> <ol style="list-style-type: none"> 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. <p>Management-intensive grazing</p> <ol style="list-style-type: none"> 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. <p>Total mixed ration</p> <ol style="list-style-type: none"> 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.
<p>Objective 7</p> <p><i>Ask students what records should be kept for the dairy operation to run smoothly.</i></p>	<p>Identify the records that must be kept for profitable dairy production.</p> <ol style="list-style-type: none"> 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
<p>Objective 8</p>	<p>Describe the factors involved in marketing dairy products.</p>

Instructor Directions	Content Outline
<p><i>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.</i></p>	<ol style="list-style-type: none"> 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.
<p>Application:</p> <p> AS 1 - Costs and Returns</p>	<p>Answers to AS 1</p> <ol style="list-style-type: none"> 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	Content Outline
	<p>20. 0 21. 120 22. 20 23. 220 24. 50 25. (a) 1,000 (b) 50% (c) 500 26. 400 27. 15,576 28. 11,014, which is the total profit for the dairy operation</p> <p>Other activities: Obtain copies of the latest NRC recommendations for dairy rations, and have students develop feeding programs for dairy cattle.</p>
Closure/Summary	<p>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.</p>
Evaluation: Quiz	<p>Answers:</p> <ol style="list-style-type: none"> 1. d 2. a 3. d 4. c 5. a 6. Eight weeks after calving 7. A total mixed ration is a mixture of all the feed ingredients needed by dairy cattle, including forages, grain, and supplements. 8. The cow's nutritional needs are highest when lactation peaks. 9. Information on production levels and milk composition for each cow. 10. A management-intensive grazing system helps lower costs by reducing the costs associated with equipment for harvesting forages and purchased feeds.

Lesson 4: Herd Management

Name _____

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: _____

Gross income	Your farm	Example farm
1. (a) Pounds of milk sold for the month (from your milk check)		181,903
(b) Divide (a) by 100 to get milk sales in hundredweights		1,819
2. Gross milk price (\$ per hundredweight)		\$12.50
3. Compute gross milk sales by multiplying 1(b) by step 2		22,738
4. Livestock sales related to dairy		3,000
5. Capital revolvments and other dairy income		0
6. Add lines 3, 4 and 5 for total gross receipts		25,738
Variable expenses	Your farm	Example farm
7. (a) Market value of purchased concentrates, alternative feeds, vitamins and minerals		6,250
(b) Market value of purchased forages consumed		2,873
(c) Market value of home-raised grains consumed		667
(d) Market value of home-raised haylage and silage consumed		0
(e) Market value of home-raised hay consumed		0
8. Estimate the monthly value of pasture consumed		
(a) Average number of head on pasture for the month		20
(b) Monthly pasture charge		\$5
(c) Multiply (a) by (b)		100
9. Total 7(a) through 7(e) and 8(c) to compute the total value of feedstuffs consumed		9,890
10. Estimate the true cost of labor for the dairy enterprise		
(a) Amount spent for hired labor for the month (including benefits)		2,000
(b) Hours of unpaid family labor		330
(c) Value of family labor		\$5
(d) Multiply (b) and (c)		1,650
(e) Value of your operator labor		200 hours x 8 = 1,600
(f) Portion of time the labor force was used on the dairy enterprise		75%
(g) Add lines (a), (d) and (e) and multiply by (f)		5,250 x .75 = 3,938
11. Milk check deductions		1,764
12. Expenses for DHIA fees		200
13. Expenses for artificial insemination		283
14. Expenses for veterinary fees and medicine		500
15. Expenses for dairy supplies; the portion of the following costs related to the dairy only		667
16. Expenses for fuel and oil		.3 x 299 = 90
17. Utility bills		.5 x 558 = 279
18. Building repairs		208
19. Machinery repairs		.33 x 1,050 = 347
20. Farm taxes		0
21. Farm insurance		.5 x 300 = 150
22. Any legal and professional fees		.5 x 42 = 21
23. Car and truck expenses		.5 x 333 = 167
24. Other expenses		100
25. (a) Interest payments		1,567
(b) Portion of the interest payment that went for the dairy enterprise		75%
(c) Multiply (a) by (b)		1,175
26. Get estimate for annual depreciation expenses of dairy enterprise. Divide this by figure 12		642
27. Estimate total operating expenses by adding steps 9, 10(g), 11 through 24, 25(c) and 26		20,419
28. Estimate income over operating expenses by subtracting step 27 from step 6		5,318

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

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

SC/ST/3/B/09-11/b

SC/ST/3/B/09-11/c

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.
4. *Introduction to Dairy Production Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

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
 - Dairy Publications. MU Extension. University of Missouri-Columbia. Accessed April 12, 2007, from <http://extension.missouri.edu/explore/agguides/dairy/>.
 - Harris, B., and J. K. Shearer. *Raising Dairy Replacement Heifers*. University of Florida, IFAS Extension. Accessed August 30, 2007, from <http://edis.ifas.ufl.edu/DS150>.
 - Heifer Management Featured Articles. TheDairySite. Accessed August 30, 2007, from <http://www.thedairysite.com/articles/cat18/heifer-management>.
 - Production and Management Featured Articles. TheDairySite. Accessed August 30, 2007, from <http://www.thedairysite.com/articles/cat25/production-and-management>.

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- ❑ Waldner, D. N., J. Kirkpatrick, and T. W. Lehenbauer. *Recommended Vaccination Schedules for a Comprehensive Dairy Herd Health Program*. Accessed August 30, 2007, from <http://osuextra.okstate.edu/pdfs/F-4354web.pdf>.
2. Print
- ❑ Andrews, A. H. *The Health of Dairy Cattle*. Blackwell Publishing Limited, 2000.
 - ❑ Thomas, H. S. *Getting Started with Beef and Dairy Cattle*. North Adams, MA: Storey Publishing, LLC, 2005.
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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.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>Ask students what the common herd health concerns in lactating dairy cattle are. Use PPt 1 as a guide for discussion.</i></p> <p><input type="checkbox"/> PPt 1 - Health Problems in Lactating Dairy Animals</p>	<p>Describe the common herd health problems in lactating dairy animals.</p> <p>Milk fever</p> <ol style="list-style-type: none">1. Results from a calcium imbalance and involves abnormally low levels of calcium in the blood2. Causes loss of appetite, staggering, and paralysis; can cause death if untreated3. Treated with an intravenous injection of calcium by a veterinarian4. Prevented by feeding dry cows rations with correct levels of calcium and phosphorus <p>Ketosis</p> <ol style="list-style-type: none">1. Results from underfeeding during the period of high lactation shortly after calving2. Causes reduced milk production, weight loss, and a fruity odor to the breath and milk3. Treated with injections of glucose or hormones4. Prevented by feeding high energy diets to lactating dairy cattle <p>Foot rot</p> <ol style="list-style-type: none">1. Caused by a wound between the toes2. Causes lameness, swelling, fever, decreased appetite, and a sharp decrease in milk production3. Treated with foot baths and antibiotics <p>Hairy heel warts</p> <ol style="list-style-type: none">1. Causes an extremely painful growth on the skin on the heels of the rear feet2. May cause animals to avoid putting weight on their

Instructor Directions	Content Outline
	<p>heels; also associated with decreased milk production</p> <ol style="list-style-type: none"> 3. May be treated with the use of antibiotic sprays on the affected area <p>Laminitis</p> <ol style="list-style-type: none"> 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 <p>Mastitis</p> <ol style="list-style-type: none"> 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
<p>Objective 2</p> <p><i>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.</i></p> <p> AS 1 - California Mastitis Test (CMT)</p>	<p>Explain how mastitis is prevented and controlled.</p> <p>Prevention</p> <ol style="list-style-type: none"> 1. Proper sanitation <ol style="list-style-type: none"> 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 prepip the teats before milking instead of washing them. 2. Testing for subclinical mastitis <ol style="list-style-type: none"> a. Producers should give tests at least once every month to detect the high somatic cell counts caused by subclinical mastitis.

Instructor Directions	Content Outline
	<ul style="list-style-type: none"> b. Producers can administer the California Mastitis Test. c. Laboratory tests can be used to determine somatic cell counts more accurately. <p>3. 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.</p> <p>Treatment</p> <ul style="list-style-type: none"> 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.
<p>Objective 3</p> <p><i>Ask students what the common health problems in raising replacement heifers are. Write suggestions on the board or overhead.</i></p>	<p>Describe the common herd health problems in raising replacement heifers.</p> <p>Diarrhea, or scours, is the biggest health concern; it causes dehydration if not treated properly.</p> <p>Brucellosis</p> <ul style="list-style-type: none"> 1. Brucellosis causes abortions, sterility, and reduced milk production. 2. Heifers should be vaccinated at four to seven months of age. <p>Leptospirosis</p> <ul style="list-style-type: none"> 1. Leptospirosis causes abortions. 2. Heifers should be vaccinated against leptospirosis and other reproductive diseases before breeding. <p>Other diseases</p> <ul style="list-style-type: none"> 1. Bovine rhinotracheitis (IBR) 2. Pasteurella (PI3) 3. Bovine viral diarrhea (BVD) 4. Blackleg

Instructor Directions	Content Outline
	5. Heifers should be vaccinated between weaning and eight months of age, with boosters given as appropriate.
<p>Objective 4</p> <p><i>Ask students to describe how medications should be administered to dairy cattle. Use PPt 2 to illustrate different routes of administration.</i></p> <p><input type="checkbox"/> PPt 2 – Routes of Administration</p>	<p>Explain how medications are administered.</p> <ol style="list-style-type: none"> 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
<p>Application:</p> <p><input type="checkbox"/> AS 1 – California Mastitis Test (CMT)</p>	<p>Answers to AS 1 Scores should be based on student participation.</p> <p>Other activities:</p> <ol style="list-style-type: none"> 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.
<p>Closure/Summary</p>	<p>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.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ol style="list-style-type: none"> 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

Instructor Directions	Content Outline
	milk production and an elevated somatic cell count.

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

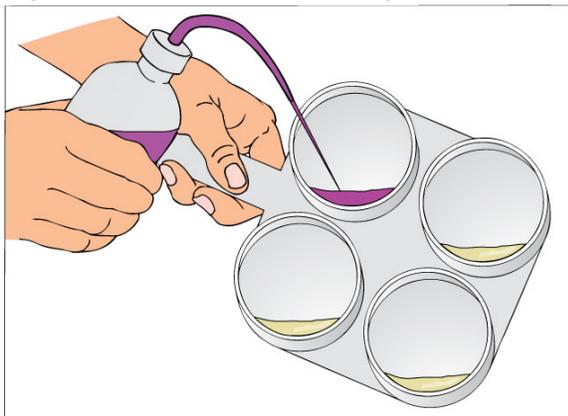
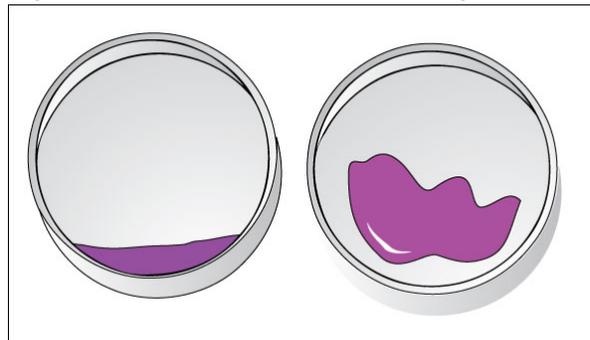


Figure 1.2 - Normal Milk Versus Strong Reaction



UNIT - INTRODUCTION TO DAIRY PRODUCTION Name _____

Lesson 5: Herd Health

Date _____

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

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

SC/ST/1/B/09-11/a SC/ST/1/C/09-11/a SC/ST/3/B/09-11/a
 SC/ST/3/D/09-11/a

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.
3. *Introduction to Animal Nutrition Curriculum Enhancement*. University of Missouri-Columbia: Instructional Materials Laboratory, 2003.

Supplies & Equipment

- Store-bought milk sample

Supplemental Information

1. Internet Sites
 - Bennett, R., and L. J. Butler. *Western Dairying: Environmentally Responsible Agriculture?* University of California. Accessed August 31, 2007, from <http://www.sarep.ucdavis.edu/newsltr/components/v1n4/sa-9.htm>.
 - Dairy Publications. MU Extension. University of Missouri-Columbia. Accessed April 12, 2007, from <http://extension.missouri.edu/explore/agguides/dairy/>.
 - Milk and Dairy Beef Quality Assurance Center. Accessed August 31, 2007, from <http://www.dqacenter.org/>.
2. Print
 - Brouwer, F., and D. E. Ervin, eds. *Public Concerns, Environmental Standards and Agricultural Trade*. New York: CABI Publishing, 2002.

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.

Instructor Directions	Content Outline
<p>Objective 1</p> <p><i>Ask students what concerns consumers have about dairy production. Discuss why consumers might be concerned about these things.</i></p>	<p>Discuss some concerns consumers have about the dairy industry.</p> <ol style="list-style-type: none">1. Waste management – contamination of ground and surface water by improperly handled, untreated waste2. Drug usage in lactating cows – presence of drugs given to lactating cows in fluid milk, which may be harmful to humans3. 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
<p>Objective 2</p> <p><i>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.</i></p> <p> AS 1 - Debate – Animal Welfare</p>	<p>Explain how the dairy industry is addressing consumer concerns.</p> <p>Waste management – education by the industry concerning waste storage, management, and land application</p> <p>Drug usage – Milk and Dairy Beef Quality Assurance programs</p> <ol style="list-style-type: none">1. Programs educating producers about management practices that can help them produce high quality milk and pure beef products2. Focus on several points that can help producers improve their milk, including proper herd health management, sanitation, feeding, and record keeping <p>Animal welfare – information by dairy-related agencies to educate producers about management practices that will ensure animal welfare</p>

Instructor Directions	Content Outline
<p>Objective 3</p> <p><i>Ask the class how they know that the food supply, especially dairy products, is safe.</i></p>	<p>Explain how the consumer knows that he or she has a safe food product.</p> <p>Consumers can be sure that dairy products are safe because of inspections by the USDA and state regulatory agencies.</p> <ol style="list-style-type: none"> 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.
<p>Application:</p> <p> AS 1 - Debate – Animal Welfare</p>	<p>Answers to AS 1</p> <p>Students should be graded on their participation and the quality of the research for the debate.</p>
<p>Closure/Summary</p>	<p>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.</p>
<p>Evaluation: Quiz</p>	<p>Answers:</p> <ol style="list-style-type: none"> 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.

Lesson 6: Industry Issues

Name _____

Debate--Animal Welfare**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.

