

Dear Educator,

The United Nations projects that the global population will reach nearly 10 billion by the year 2050. Feeding this many people at a time when Earth's resources are already strained is a daunting task for farmers, who must find ways to provide *sustainable* nutrition — food that benefits human welfare *and* the environment.

Farming for the Future is a free educational program that explores the concept of sustainable nutrition by focusing on dairy farms, which already produce foods that pack a nutritional punch in an affordable and increasingly sustainable way. Created by the curriculum experts at Young Minds Inspired (YMI) in cooperation with American Dairy Association North East (ADANE), the program features standards-based activities that will engage your students in critical thinking as they research, debate, and brainstorm how farmers can feed the world in ways that support nutritional, economic, and environmental needs.

We hope that you will share this valuable program with other teachers in your school. Although the materials are copyrighted, you may make as many copies as needed for educational purposes. Please use the enclosed reply card or comment online at ymiclassroom.com/feedback-adane-hs to provide feedback. We look forward to hearing from you.

Sincerely,



Rick Naczi
CEO
American Dairy Association
North East



Dr. Dominic Kinsley
Editor in Chief
Young Minds Inspired



For questions, contact us toll-free at 1-800-859-8005 or by email at feedback@ymiclassroom.com.

FARMING *for the* FUTURE

Target Audience

Students in high school science and social studies classes

Program Objectives

- Guide students in understanding sustainable nutrition as the intersection between health, economic, environmental, and social impacts.
- Examine the value of dairy farming in sustainable food systems that support the needs of global populations, benefit animal care, reduce impact on surrounding ecosystems, and support local economies.
- Encourage students to think critically and to examine contemporary issues from a global perspective.
- Introduce students to career options in the agricultural sector.

Program Components

- This one-page teacher's guide
- Three reproducible activity sheets
- A colorful classroom wall poster
- A reply card for your comments, or comment online at ymiclassroom.com/feedback-adane-hs

How to Use This Program

Photocopy and distribute the activity sheets before displaying the poster in your classroom. Schedule the activities and provide ample time for classroom discussion of the relevant concepts. Students will need access to the internet for research. To review program alignment with Next Generation Science Standards, visit ymiclassroom.com/adane-hs.

ACTIVITY 1

What Is Sustainable Nutrition?

Begin by discussing what students may already know about sustainable nutrition. Ask them to consider each issue on the activity sheet on a local, national, and global scale. Then allow time for them to work in small teams to research and brainstorm ideas to complete the sheet.

Answers: Answers will vary. Download an answer key at ymiclassroom.com/adane-hs.

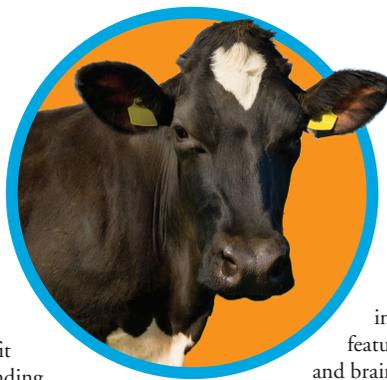
EXTENSIONS

- Explain to students that one in eight children in the U.S. faces food insecurity. Have the class research efforts by the dairy industry to close the hunger gap and ask students to brainstorm new products or distribution channels to get more dairy nutrition into the hands of more people, domestically or globally. Suggested links to get them started: usdairy.com/science-and-research/product-innovation-and-dairyfoods.com.
- Use this lesson as a starting point for teaching students to understand the difference between “essential” nutrients and those that the body can produce, complete versus incomplete proteins, or fortified versus naturally occurring nutrients.

ACTIVITY 2

Greener Pastures

Divide the class into groups of 2-3 students and provide time for them to research and complete the chart on the activity sheet following the example. Conclude with a discussion about each of the technologies featured, asking students which efforts were most interesting or surprising,



and which they thought might have the greatest impact.

Answers: Answers will vary. Download an answer key at ymiclassroom.com/adane-hs.

EXTENSIONS

- High start-up costs can be a major barrier preventing small farms from implementing some of the technologies featured on the chart. Have students research and brainstorm ways to bring these systems to more farms without the burden of major debt (e.g., regional cooperatives).
- Using what they've learned, ask students to engineer additional systems farmers can use to grow their businesses while supporting local ecosystems and communities.

ACTIVITY 3

Full Circle

Begin by asking students what they know about dairy farming. After students take the quiz in Part 1, discuss the results as a class. Review any myths or misconceptions and ask students to share how their understanding may have changed. You can use this as an opportunity to discuss the importance of critical thinking that involves looking at issues from multiple perspectives.

Conclude this part of the activity by introducing students to some of the farm families at americandairy.com/dairy-farms/farm-families/?page=1.

Part 1 Answers: 1. A; 2. D; 3. C; 4. A; 5. C; 6. T; 7. T; 8. T; 9. F (dairy cows voluntarily go in for milking two or three times a day); 10. T.

For Part 2, guide students in using O*NET Online as a resource for researching career paths. Point out that each career cluster includes a broad range of jobs in related industries, with opportunities for many education levels and areas of interest. Apart from the “Agriculture, Food, and Natural Resources” cluster, ask students to consider other relevant clusters, such as in government policy or manufacturing.

EXTENSIONS

- Have students research local farms and related businesses in the “Agriculture, Food, and Natural Resources” cluster. Ask them to record and share details about how the business contributes to the local economy and food supply.
- If you live in an agricultural area, ask students to bring in news articles about local farms that focus on animal care, economic issues, environment, and/or innovation in the region for the class to discuss.

Resources

- American Dairy Association North East: americandairy.com
- Virtual Farm Tours: americandairy.com/dairy-in-schools/virtual-farm-tour.stml
- Dairy and the Environment: americandairy.com/dairy-farms/dairy-and-the-environment
- Sustainability on E-Z Acres Farms: americandairy.com/news-and-events/news/news/e-z-acres-wins-outstanding-dairy-farm-sustainability-award.stml
- Mercer Vu Farm: chesapeakebay.net/news/blog/theres_no_separation_anxiety_at_this_pennsylvania_farm
- Raising Crops for Dairy Cows: youtu.be/tA53MT0FmWY
- Career Finder: onetonline.org/find/career?c=1

ACTIVITY
1

What Is Sustainable Nutrition?

Sustainability is a buzzword in media reports and government policy, but what does it really mean?

Part 1: Green Communities

Write your definition of sustainability in the following space. Give an example, such as solar energy, and explain what factors can make it sustainable.

Now list three considerations that you think would make a farm or other food source sustainable:

1. _____
2. _____
3. _____

List two local initiatives you've noticed in your community to increase sustainability, particularly in the food system. Use this example as a guide:

The local grocery store has a produce section identified as grown on nearby farms.

1. _____

2. _____



Part 2: Green Earth

The United Nations projects that global population will reach nearly 10 billion by the year 2050. What do you think it will take to feed that many people in a sustainable way? Here are some links to help you research the various aspects of this issue:

- National Health and Nutrition Examination Survey on meeting calcium needs: ncbi.nlm.nih.gov/pubmed/17081826
- Proceedings of the National Academy of Sciences of the United States of America study of impact of removing animals from food supply: pnas.org/content/114/48/E10301
- Nourishing people sustainably: dairygood.org/content/2019/sustainable-diets-must-nourish-people-protect-planet
- Innovation Center for U.S. Dairy: usdairy.com/science-and-research/product-innovation

On a separate sheet of paper, list and analyze a few of the proposals you read about, as well as any of your own ideas. Use the example below as a guide.

Proposal	Pros	Cons
Create community gardens for people to grow their own produce	<ul style="list-style-type: none"> • Access to fresh fruits and vegetables • Tailored to regional diets and environments 	<ul style="list-style-type: none"> • Volunteers must be willing to participate • Land required • Unpredictable environmental conditions • Limited nutrient profile for volume produced

Food for Thought

When considering sustainable nutrition, the key is to strike a *balance* among environmental concerns, economics, and health needs. For example, almond beverage has been hailed as a greener alternative to cow's milk because it uses less water to produce. But did you know that it would take at least 32 ounces of almond beverage to get the same amount of protein as an 8-ounce glass of milk? And, unlike almond beverages and other alternatives, dairy milk is produced locally in all 50 states, reducing the need for long-distance transportation.



Now take a look at the nutritional profile of milk on the wall poster. Reflect on this information and your research findings to write a short position paper describing the role dairy could play in sustainable diets on a global scale. Think about the amount of food, and the different types of food, that would be required to replicate the nutrients found in milk. How would the environmental footprint and cost of all those varied resources compare to the cost and footprint of providing three servings of dairy, considering that a cow can produce up to seven gallons of milk per day?



Local milk is available 365 days a year.



AMERICAN DAIRY ASSOCIATION NORTH EAST



ACTIVITY
2

Greener Pastures

Technology and modern agricultural practices enable dairy farmers to be good stewards of the environment while building successful businesses. For example, farms like Reinford Farms in Pennsylvania use anaerobic digesters to convert methane, a greenhouse gas released from cow manure, into a source of electricity. And for dairy farmers in the Chesapeake Bay watershed — an ecosystem that is home to 18 million people and fed by 7 large rivers and 100,000 tributaries — protecting local waterways is critical.



Dairy cows on Cottonwood Farms in Pavilion, N.Y., are grazed on pasture for several months out of the year.

Read the article at americandairy.com/dairy-farms/dairy-and-the-environment and review the Chesapeake Bay watershed map to learn more about efforts to reduce runoff and erosion. As you follow the links on the page to watch the videos and learn more about manure separation, water management, forest buffers, etc., think about the many people involved in the dairy industry and the complex economic and environmental considerations of each decision.

Use this chart to list how each agricultural practice or technology benefits the local ecosystem and/or community, and the farm itself. One has been provided as an example.

Technology/ System	Benefits to Ecosystem and Community	Benefits to Farm
Riparian (or forest) buffers	<ul style="list-style-type: none"> • Filters pollutants from storm runoff, leading to cleaner groundwater and streams • Increases wildlife habitats • Healthier drinking water 	<ul style="list-style-type: none"> • Less work/money spent on soil maintenance • Removes less productive, highly erodible cropland from use, allowing farmers to focus resources on more productive cropland
Cover crops and no-till fields		
Recycled manure and methane digesters		
Covered manure storage		
Recycled materials for barn stall bedding		
Reuse of water two to three times for farm operations		
Woodchip bioreactor		
Precision feeding		



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ACTIVITY 3 Full Circle



Milk is a nutritional powerhouse, and over the past decades, agricultural practices have enabled dairy farmers to produce more milk with fewer resources. In fact, more milk is produced today with only 9 million cows than with 26 million cows in 1944. How? Dairy farmers take great care to provide the best environment, food, and medical care for their cows, because comfortable cows are productive cows!



Dairy farming is a rewarding career that often allows families to work together. Abbie Evans (pictured at left) works alongside her husband, Andrew, on their dairy farm in northeastern Pennsylvania.

Part 1: Myth vs. Reality

How much do you already know about the care of dairy cows and the value of their milk? Take this quiz to test your knowledge. In the left column, circle the correct answer. In the right column, check off whether the statement is true or false.

- | | |
|--|--|
| <p>1. About _____ of U.S. dairy farms are family owned and operated.
A. 95% C. 70%
B. 45% D. 15%</p> <p>2. Cow manure can be recycled into _____ and even pots for planting.
A. energy C. bedding for cows
B. fertilizer D. all of the above</p> <p>3. Many dairy farmers also recycle _____ up to 3 times — first, for cooling milk, then for cleaning stalls, and finally as a nutrient-rich fertilizer for the fields.
A. packaging C. water
B. corn husks D. storage tanks</p> <p>4. Each day, a cow drinks about 35 gallons of water — enough to fill a bathtub — and produces approximately _____ of milk.
A. 7 gallons C. 35 gallons
B. 25 ounces D. 1 gallon</p> <p>5. Milk is tested for _____ on the farm and at the processing plant. If milk tests positive, it cannot be sold to the public.
A. hormones C. antibiotics
B. viruses D. excess fat</p> | <p>Now decide if each statement is true or false.</p> <p>6. Cows spend about 8 hours chewing their cud every day.
<input type="checkbox"/> True <input type="checkbox"/> False</p> <p>7. Cows can get nutrition from byproducts of other farms, like citrus pulp from juice farms and cottonseed from cotton farms.
<input type="checkbox"/> True <input type="checkbox"/> False</p> <p>8. Cows' diets are carefully designed by farmers and nutritionists to provide the best nutrition possible for optimal health.
<input type="checkbox"/> True <input type="checkbox"/> False</p> <p>9. Robotic milking systems allow dairy farmers to put cows on a strict schedule for maximum production that automatically milks them every 1-2 hours.
<input type="checkbox"/> True <input type="checkbox"/> False</p> <p>10. In free-stall barns, cows can move about to eat, drink, and rest whenever they like; these enclosures let in fresh air and sunshine, while providing shade and protection from the wind, cold, or rain.
<input type="checkbox"/> True <input type="checkbox"/> False</p> |
|--|--|

Part 2: Future Dairy Farmer?

Dairy farms create an estimated 900,000 jobs in the U.S. Whether you're interested in agriculture and animals, food science, environmental protection, or even engineering, you can explore your area of interest in sustainability with career options across the dairy industry.

Visit O*NET Online (onetonline.org/find/career?c=1) and check out the career cluster, "Agriculture, Food, and Natural Resources." Choose a path that best fits your personal interests, values, and career goals. Use what you find to complete the following chart, and note any career-specific information you would need before pursuing this option in the future. You can make another copy of the chart to check out more than one path.

Career Path	
Education needed	
Additional skills required	
Average salary	
Job environment (work activities/context)	
Occupational outlook	
Reasons it seems like a good fit	
Reasons it may not be a good fit	
Notes to research further	



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