Dear Educator,

The recent battle against COVID-19 threw a spotlight on the complex process involved in getting food from farms to our tables in the U.S. But there are even greater challenges ahead. 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. Return the enclosed reply card to let us know your opinion of this program, or comment at ymiclassroom.com/feedback-adane-hs. Teachers who provide feedback have the chance to receive 36 free CowPots (pots you plant) and starter seeds for the classroom while supplies last.

We look forward to your comments.

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.
• Demonstrate how milk and dairy products are continually tested to ensure safety and quality.

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 and Common Core standards, visit ymiclassroom.com/adane-hs.

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.

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.
What Is Sustainable Nutrition?

Sustainability is a buzzword in media reports and government policy, but what does it really mean? For farmers like Bret Bossard, who owns Barbland Dairy in Fabius, N.Y., it means carefully following agricultural practices that will support the needs of the farm and its community now and for generations to come.

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. _____________________________________________

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.

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

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.

<table>
<thead>
<tr>
<th>Proposal</th>
<th>Pros</th>
<th>Cons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Create community gardens for people to grow their own produce</td>
<td>• Access to fresh fruits and vegetables • Tailored to regional diets and environments</td>
<td>• Volunteers must be willing to participate • Land required • Unpredictable environmental conditions • Limited nutrient profile for volume produced</td>
</tr>
</tbody>
</table>

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 eight gallons of milk per day?
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 seven large rivers and 100,000 tributaries — protecting local waterways is critical.

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.

<table>
<thead>
<tr>
<th>Technology/System</th>
<th>Benefits to Ecosystem and Community</th>
<th>Benefits to Farm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Riparian (or forest) buffers</td>
<td>• Filters pollutants from storm runoff, leading to cleaner groundwater and streams</td>
<td>• Less work/money spent on soil maintenance</td>
</tr>
<tr>
<td></td>
<td>• Increases wildlife habitats</td>
<td>• Removes less productive, highly erodible cropland from use, allowing farmers to focus resources on more productive cropland</td>
</tr>
<tr>
<td>Cover crops and no-till fields</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recycled manure and methane digesters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Covered manure storage</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Recycled materials for barn stall bedding</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Reuse of water two to three times for farm operations</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Woodchip bioreactor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Precision feeding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Local milk is available 365 days a year.
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!

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.

1. About ______ of U.S. dairy farms are family owned and operated.
   A. 95%   B. 45%   C. 70%   D. 15%

2. Cow manure can be recycled into ______ and even pots for planting.
   A. energy   B. fertilizer   C. bedding for cows   D. all of the above

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   B. corn husks   C. water   D. storage tanks

4. Each day, a cow drinks about 35 gallons of water — enough to fill a bathtub — and produces approximately ______ of milk.
   A. 8 gallons   B. 25 ounces   C. 35 gallons   D. 1 gallon

5. Milk is tested for ______ on the farm and at the processing plant to be sure it is safe for consumers to drink.
   A. hormones   B. viruses   C. antibiotics   D. excess fat

6. Cows spend about 8 hours chewing their cud every day.
   □ True   □ False

7. Cows can get nutrition from byproducts of other farms, like citrus pulp from juice farms and cottonseed from cotton farms.
   □ True   □ False

8. Cows’ diets are carefully designed by farmers and nutritionists to provide the best nutrition possible for optimal health.
   □ True   □ False

9. Robotic milking systems enable cows to be milked on their own schedules — two to three times per day — and help farmers spend time caring for cows in other ways.
   □ True   □ False

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.
    □ True   □ False

Part 2: Farm to Family

Have you ever wondered how the dairy products you enjoy get from the farm to your refrigerator? It takes careful coordination by a bustling, localized industry and frequent testing along the way that ensures that milk is one of the safest foods you can purchase. And it is never touched by human hands until you open the container.

To test how much you know, use the word bank to fill in the blanks.

- robotic
- degrees
- grocery
- homogenized
- insulated
- nutritious
- pasteurized
- packaged
- standardized

1. On a dairy farm, cows receive plenty of ______ food, fresh water, comfortable housing, and regular veterinary care.

2. Using a ______ milking machine, cows choose when they want to be milked, generally two to three times a day.

3. Milk is cooled to 35 ______ and then transported in a milk truck, which is a refrigerator on wheels.

4. ______ tanker trucks haul this fresh milk to a processing facility.

5. Then, it is ______ to various fat levels (fat-free, 1%, 2%, or “whole” milk).

6. Next, the milk is ______, or heated to kill potentially harmful bacteria, and ______ so it doesn’t separate and rise to the top.

7. Finally, the milk is ______ or processed into cheese, yogurt, etc.

8. Refrigerated trucks transport milk and dairy foods to ______ stores or local schools for you and your family to enjoy!