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

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.

EXTENSIONS
• Explain to students that one in seven 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 dairyproducts.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.

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.

Full Circle
Begin by asking students what they know about dairy farming and processing of milk products. How far do they think milk travels from the farm to their grocery store? How do we know milk is safe to drink? After students take the quizzes in Parts 1 and 2, 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 the activity by introducing students to some of the farm families at americandairy.com/dairy-farms/farm-families/?page=1.


Part 2 Answers: 1. nutritious; 2. robotic; 3. degrees; 4. insulated; 5. standardized; 6. pasteurized; homogenized; 7. packaged; 8. grocery

EXTENSIONS
• Have students research local farms and related businesses in the “Agriculture, Food, and Natural Resources” cluster at O*NET Online, a resource for researching career paths (onetonline.org/find/cluster/c-1). Ask them to record and share details about how the business contributes to the local economy and food supply. Students can also explore career options and share the job details and skills.
• 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.shtml
• Mercer Vu Farm: chesapeakebay.net/news/blog/theres_no_separation_ anxiety_at_this_pennsylvania_farm
• Raising Crops for Dairy Cows: youTube.be/tA53MTdFmWY
• Feeding America: feedingamerica.org/about-us/press-room/child-food-insecurity-could-hit-all-time-high
• Lessons: ymiclassroom.com/adane

Milk Production
farmpros.com/blog/dairy-industry-facts-0
• usdairy.com/news-articles/milk-more-local-than-you-may-think
• milk.procon.org/how-milk-gets-from-the-cow-to-the-store/
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
• 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.

<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></td>
</tr>
<tr>
<td></td>
<td>• Increases wildlife habitats</td>
<td>• Less work/money spent on soil maintenance</td>
</tr>
<tr>
<td></td>
<td>• Healthier drinking water</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>
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<td>Reuse of water two to three times for farm operations</td>
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</tr>
<tr>
<td>Woodchip bioreactor</td>
<td></td>
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</tr>
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<td>Precision feeding</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Local milk is available 365 days a year.
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.

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!
**SUSTAINABLE NUTRITION in EVERY GLASS**

**Environmentally Sustainable**
- Dairy farms have reduced their carbon footprint by more than 60% since the 1940s.¹
- Milk is produced in all 50 states, supporting local economies and reducing need for long-distance transport.
- Dairy contributes only 2% of the United States’ greenhouse gas emissions.² Farmers are continuously working to find new ways to further reduce its GHG emissions.
- Dairy farmers practice sustainability by recycling water and waste.

**Packed With Nutrients**

The USDA recommends that Americans age 9 and older consume 3 servings of dairy products every day, because dairy is a nutritional powerhouse! It contains 9 essential nutrients that can be hard to replace in a healthy diet pattern.

Three 8-ounce cups of milk provide:³

<table>
<thead>
<tr>
<th>Nutrient</th>
<th>As Much Nutrition as Approximately:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Protein</td>
<td>4 large hard-boiled eggs</td>
</tr>
<tr>
<td>Calcium</td>
<td>17 cups of raw kale</td>
</tr>
<tr>
<td>Phosphorous</td>
<td>3 cups of cooked kidney beans</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>3 cups of sliced red peppers</td>
</tr>
<tr>
<td>Vitamin B2 (Riboflavin)</td>
<td>⁹⁄₅ cup of whole almonds</td>
</tr>
<tr>
<td>Vitamin B3 (Niacin)</td>
<td>6 large white mushrooms</td>
</tr>
<tr>
<td>Pantothenic Acid</td>
<td>5 cups of chopped broccoli</td>
</tr>
<tr>
<td>Vitamin B12 (Cobalamin)</td>
<td>1 lb. of pork chops</td>
</tr>
<tr>
<td>Vitamin D</td>
<td>15 sardines</td>
</tr>
</tbody>
</table>

**Sustainable Nutrition**

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FARMING for the FUTURE

Explore how dairy farmers pair nutrition and sustainability to benefit cows, the planet, and you

OPEN TODAY!

Meets Next Generation Science Standards

Look inside for another FREE educational program!

605 Washington Avenue, North Haven, CT 06473
Please fill out and return this response card to receive FREE YMI programs in the future.

Return this card or respond at ymiclassroom.com/feedback-adane-hs for the chance to receive 36 free CowPots (pots you plant) and starter seeds for your classroom while supplies last.

Name ____________________________________________ (Please print clearly.)

School ________________________________________________

Address ________________________________________________

City __________________________________ State _____ Zip ____________

Email _______________________________________________ Phone __________________

I teach grade(s) __________________________ Subjects ___________________

Number of teachers using this program ________ Number of students using this program ________

Please rate this program’s appeal to students: □ Excellent  □ Good  □ Fair  □ Poor

Please rate this program’s educational effectiveness: □ Excellent  □ Good  □ Fair  □ Poor

I would like to serve on YMI’s Educator Advisory Panel for future programs. □ Yes  □ No

Your opinion of this program is important to us. Please take a moment to comment.

____________________________________________________________________________________

____________________________________________________________________________________

YMI will not disclose your name to third parties.
FARMING for the FUTURE

YMI
605 WASHINGTON AVE SUITE 13
NORTH HAVEN CT 06473-9903
**Part 1:** Answers will vary. Definitions of sustainability should focus on the use of a resource without depleting it, or a system that is economically viable enough to continue long-term. For example, solar power is sustainable because the sun’s energy can be harnessed without any damage to the sun or reduction in the amount of light it will emit in the future. Recycling is sustainable if the recycled materials can be used for a new product.

To support sustainable nutrition, food sources must provide for successful long-term management of resources, economies, and consumer health. Local sustainability ideas could include purchasing locally grown produce to reduce emissions from transportation; using solar power for homes as well as schools and town centers; and “Too Good to Toss” events in which communities swap old clothing and home goods instead of throwing them into a landfill.

**Part 2:** Although responses will vary, below is an overview of the ideas featured in the articles.

<table>
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<th>Cons</th>
</tr>
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</table>
| Reduce consumption of meat and dependency on animal-derived foods | • Reduction of greenhouse gas emissions  
• More farmland available for crops | • Removing animals from food supply shown to have less of an impact than expected  
• Meat and dairy are nutrient-dense and would need to be replaced by very large quantities of alternative foods |
| Increase access to dairy products globally | • Nutritional powerhouse  
• Can be tailored to regional environments (cows, goats, etc.) and scale of economy  
• Modern practices can reduce resource use and pollution | • Communities may need training to properly care for animals  
• Local production overseas might impact U.S. exports |
Greener Pastures

Although charts will vary, these are some general concepts which can be found at americandairy.com/dairy-farms/dairy-and-the-environment/.

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<td>Riparian (or forest) buffers (1,6)</td>
<td>• Filters pollutants from storm runoff, leading to cleaner groundwater and streams</td>
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</tr>
<tr>
<td></td>
<td>• Healthier drinking water</td>
<td></td>
</tr>
<tr>
<td>Cover crops and no-till fields (2,4)</td>
<td>• Reduce soil erosion and water pollution</td>
<td>• Save money on soil preparation</td>
</tr>
<tr>
<td></td>
<td>• Healthier drinking water</td>
<td>• Can result in healthier crops and more abundant feed for cows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Lower inputs (e.g., fertilizer, pesticides) in some cases</td>
</tr>
<tr>
<td>Recycled manure and methane digesters (2,3,4,5,6)</td>
<td>• Reduce greenhouse gases and water pollution</td>
<td>• Costly start-up but can save money over time</td>
</tr>
<tr>
<td></td>
<td>• Alternate source of electricity</td>
<td>• Can be a source of revenue</td>
</tr>
<tr>
<td></td>
<td></td>
<td>• Healthier cows (when recycled manure is used for bedding)</td>
</tr>
<tr>
<td>Covered manure storage (1,4,6)</td>
<td>• Reduced methane emissions</td>
<td>• Although expensive for setup, keeps the land healthy for future generations</td>
</tr>
<tr>
<td></td>
<td>• Reduced risk of leakage into groundwater</td>
<td>• Properly sized storage lagoons reduce the need to apply manure onto land when weather and agronomic conditions are unfavorable</td>
</tr>
<tr>
<td>Recycled materials for barn stall bedding (2,3,4)</td>
<td>• Less waste of bedding materials</td>
<td>• Cost-effective</td>
</tr>
<tr>
<td></td>
<td>• More comfortable cows</td>
<td></td>
</tr>
<tr>
<td>Reuse of water two to three times for farm operations (3)</td>
<td>• Less waste</td>
<td>• Cost-effective</td>
</tr>
<tr>
<td>Woodchip bioreactor (6)</td>
<td>• Safer habitats and water supply</td>
<td>• Help reduce nutrients from farm runoff</td>
</tr>
<tr>
<td></td>
<td>• Reduction of water pollutants</td>
<td></td>
</tr>
<tr>
<td>Precision feeding (4,6)</td>
<td>• Reduces the amount of nitrogen and phosphorus excreted in animal waste</td>
<td>• Less costly to process</td>
</tr>
<tr>
<td></td>
<td>• Increased supply of milk without higher cost</td>
<td>• More productive cows</td>
</tr>
</tbody>
</table>

Sample source links:
2. Raising Crops for Dairy Cows: https://youtu.be/tA53MT oFmWY
3. How Do Dairy Farmers Recycle?: https://youtu.be/P3kHBWMoV50
4. There’s no separation anxiety at this Pennsylvania farm: https://www.chesapeakebay.net/news/blog/there_no_separation_anxiety_at_this_pennsylvania_farm
5. Reinford Farms: http://www.reinfordfarms.com
6. Dairy Farmers’ Commitment to a Clean Chesapeake Bay: https://www.americandairy.com/_resources/pdf/chesapeake-bay-watershecompressed.pdf

Full Circle


Part 2: 1. nutritious; 2. robotic; 3. degrees; 4. insulated; 5. standardized; 6. pasteurized; homogenized; 7. packaged; 8. grocery.