

Dear Educator,

Ensuring product moves from the farm to the table as safe, fresh, and affordable as possible is a complex process that starts at the farm. 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 challenge 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 Dairy Farmers of Wisconsin, 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 economic, environmental, and nutritional 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. Let us know your opinion of this program by commenting at ymiclassroom.com/feedback-WisconsinDairy.

Sincerely,



Tina Peterson, Director
Dairy Farmers of Wisconsin



Dr. Dominic Kinsley
Editor in Chief
Young Minds Inspired



 For questions, contact YMI 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 benefit animal care, reduce the impact on surrounding ecosystems, and support local economies as well as the needs of global populations.
- 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
- Access to WisconsinDairy.org/sustainability
- Online feedback form at ymiclassroom.com/feedback-WisconsinDairy

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. Activity sheet answers will vary. Download an answer key at ymiclassroom.com/WisconsinDairy.



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 letting students meet some of the farm families highlighted at WisconsinDairy.org/our-farms/our-farms.

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

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 at the library or online. 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 at O*NET Online (onetonline.org/find/career?c-1) and share details and skills of any interesting jobs.
- 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.



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/WisconsinDairy.

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.



What Is Sustainable Nutrition?

Discuss 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/WisconsinDairy.

EXTENSIONS

- Explain to students that one study projected that 1 in 4 children in the U.S. may have experienced food insecurity in 2022. 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 link to get them started: www.usdairy.com/news-articles/dairy-farmers-advance-environmental-practices-get-results.
- 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.

Resources

- Dairy Farmers of Wisconsin: WisconsinDairy.org
- Meet Our Farmers: WisconsinDairy.org/our-farms/our-farms
- Sustainable Farming: WisconsinDairy.org/sustainability
- Feeding America: www.feedingamerica.org/hunger-in-america/child-hunger-facts

Adapted from a program developed by American Dairy Association North East.



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, from 2007-2017, dairy farmers reduced their carbon footprint by 19% while working to provide the best housing, food, and medical care for their cows. After all, dairy farmers depend on their cows, so they are dedicated to keeping them healthy and comfortable.



Young farmers balance attending classes at school and working on their family dairy farms.

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. Visit WisconsinDairy.org and other online resources to get answers and more.

- About _____ of U.S. dairy farms are family owned and operated.
A. 94% C. 70%
B. 45% D. 15%
- Cow manure can be recycled into _____ and even pots for planting.
A. energy C. bedding for cows
B. fertilizer D. all of the above
- 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
- Each cow produces approximately _____ gallons of milk per day.
A. 8 gallons C. 35 gallons
B. 25 ounces D. 1 gallon
- 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
- Cows spend about 8 hours chewing their cud every day.
 True False
- Cows can get nutrition from byproducts of other farms, like citrus pulp from juice farms and cottonseed from cotton farms.
 True False
- Cows' diets are carefully designed by farmers and nutritionists to provide the best nutrition possible for optimal health.
 True False
- 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
- In freestall 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. To learn more, watch “Journey of Milk: Cow to Cup” at [youtube.com/watch?v=88mvvUthzLM&t=1s](https://www.youtube.com/watch?v=88mvvUthzLM&t=1s).

robotic degrees grocery
homogenized insulated nutritious
pasteurized packaged standardized

- On a dairy farm, cows receive plenty of _____ food, fresh water, comfortable housing, and regular veterinary care.
- Using a _____ milking machine, cows choose when they want to be milked, generally two to three times a day.
- Milk is cooled to 35 _____ and then transported in a milk truck, which is a refrigerator on wheels.
- _____ tanker trucks haul this fresh milk to a processing facility.
- Then, it is _____ to various fat levels (fat-free, 1%, 2%, or “whole” milk).
- Next, the milk is _____, or heated to kill potentially harmful bacteria, and _____ so it doesn't separate and rise to the top.
- Finally, the milk is _____ or processed into cheese, yogurt, etc.
- Refrigerated trucks transport milk and dairy foods to _____ stores or local schools for you and your family to enjoy!



Local milk is available 365 days a year.

Greener Pastures

Technology and modern agricultural practices enable dairy farmers to be good stewards of the environment while building successful businesses. Some Wisconsin farms use cover crops to reduce erosion and establish a quality filtration system.



Methane digester

Visit websites of some Wisconsin watershed groups to research how Wisconsin dairy farmers are working to protect and support local ecosystems.

Visit WisconsinDairy.org and/or WisconsinDairy.org/sustainability to learn how each agricultural practice or technology benefits the local ecosystem and/or community, and the farm itself. One has been provided as an example.



Julia Nunes at her family's Wisconsin dairy farm

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 digester		
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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What Is Sustainable Nutrition?

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



*<https://www.americandairy.com/wp-content/uploads/2021/05/NDC-Alternate-Beverage-Flash-Cards.pdf>



Local milk is available 365 days a year.

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, in addition to sources you find:

- World Resources Report, Creating a Sustainable Food Future: research.wri.org/wrr-food
- Can Dairy Be Sustainable? Yes, And Here's Why: www.usdairy.com/news-articles/dairy-farmers-advance-environmental-practices-get-results
- Dairy Environmental Sustainability: www.usdairy.com/sustainability/environmental-sustainability
- Milk Nutritional Profile: ymiclassroom.com/wp-content/uploads/2023/01/wd_milkcomparison.pdf
- Innovation Center for U.S. Dairy: usdairy.com/about-us/innovation-center

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

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?



Crave Brothers run a net zero farm in Wisconsin.

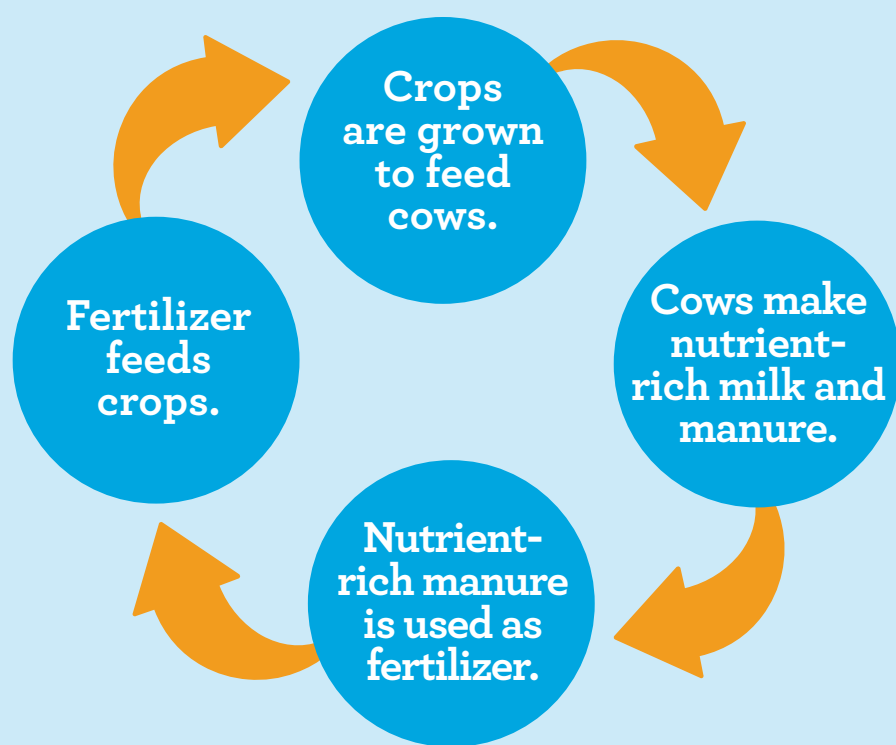




SUSTAINABLE NUTRITION *in* EVERY GLASS

Environmentally Sustainable

- The dairy industry has reduced its carbon footprint by more than 19% since 2007 and is committed to being carbon neutral by 2050.¹
- 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 (GHG) 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! One serving of milk contains many of the essential nutrients your body needs, including:³

Nutrient	What It Does	Percentage Daily Value
Calcium	Helps build and maintain strong bones and teeth.	25%
Protein	Helps build and repair tissue. Helps maintain a healthy immune system.	16%
Vitamin D	Helps build and maintain strong bones and teeth. Helps maintain a healthy immune system.	15%
Phosphorus	Helps build and maintain strong bones and teeth, supports tissue growth.	20%
Vitamin A	Helps keep skin and eyes healthy; helps promote growth. Helps maintain a healthy immune system.	15%
Riboflavin	Helps your body use carbohydrates, fats and protein for fuel.	30%
Vitamin B12	Helps with normal blood function, helps keep the nervous system healthy.	50%
Pantothenic Acid	Helps your body use carbohydrates, fats and protein for fuel.	20%
Niacin	Used in energy metabolism in the body.	15%
Zinc	Helps maintain a healthy immune system, helps support normal growth and development and helps maintain healthy skin.	10%
Selenium	Helps maintain a healthy immune system, helps regulate metabolism and helps protect healthy cells from damage.	10%
Iodine	Necessary for proper bone and brain development during pregnancy and infancy; linked to cognitive function in childhood.	60%
Potassium*	Helps maintain a healthy blood pressure and supports heart health. Helps regulate body fluid balance and helps maintain normal muscle function.	10% DRI

The % Daily Value (DV) tells you how much a nutrient in a serving of food contributes to a daily diet. 2,000 calories a day is used for general nutrition advice.
* Source: USDA FoodData Central. FDA's Daily Value (DV) for potassium of 4700 mg is based on a 2005 DRI recommendation. In 2019, NASEM updated the DRI to 3400 mg. Based on the 2019 DRI, a serving of milk provides 10% of the DRI. FDA rule-making is needed to update this value for the purpose of food labeling.

Sustainable Nutrition



Sources:
¹American Dairy Association North East, "Shrinking Our Carbon Footprint." Available at <https://www.americandairy.com/sustainability/shrinking-our-carbon-footprint-and-dairys-net-zero-goal/>.
²Thoma, G., Popp, J., et al. Greenhouse gas emissions from milk production and consumption in the United States: A cradle-to-grave life cycle assessment circa 2008. International Dairy Journal 31, Supplement 1:S3-S14, April 2013. Available at https://www.researchgate.net/publication/256686442_Greenhouse_gas_emissions_from_milk_production_and_consumption_in_the_United_States_A_cradle-to-grave_life_cycle_assessment_circa_2008.
³National Dairy Council, "13 Ways Milk Can Help Your Body," 2021. Available at <https://www.americandairy.com/wp-content/uploads/2021/05/NDC-Milk-Nutrients-NEW-.pdf>.



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FARMING *for the* FUTURE

ANSWER KEY TO ACTIVITIES



Full Circle

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

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



Greener Pastures

Although charts will vary, these are some general concepts which can be found at www.WisconsinDairy.org/sustainability.

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	<ul style="list-style-type: none"> Reduce soil erosion and water pollution Healthier drinking water 	<ul style="list-style-type: none"> Save money on soil preparation Can result in healthier crops and more abundant feed for cows Lower inputs (e.g., fertilizer, pesticides) in some cases
Recycled manure and methane digesters	<ul style="list-style-type: none"> Reduce greenhouse gases and water pollution Alternate source of electricity 	<ul style="list-style-type: none"> Costly start-up but can save money over time Can be a source of revenue Healthier cows (when recycled manure is used for bedding)
Manure storage	<ul style="list-style-type: none"> Reduced potential for polluted stormwater runoff, since farmers can apply manure on their fields when weather conditions are appropriate. Reduced risk of leakage into groundwater 	<ul style="list-style-type: none"> Although expensive for setup, keeps the land healthy for future generations Properly sized storage lagoons reduce the need to apply manure onto land when weather and agronomic conditions are unfavorable
Recycled materials for barn stall bedding	<ul style="list-style-type: none"> Less waste of bedding materials 	<ul style="list-style-type: none"> Cost-effective Comfortable cows
Reuse of water two to three times for farm operations	<ul style="list-style-type: none"> Less waste 	<ul style="list-style-type: none"> Cost-effective
Woodchip bioreactor	<ul style="list-style-type: none"> Safer water supply Reduction of water pollutants 	<ul style="list-style-type: none"> Help reduce nutrients in farm runoff
Precision feeding	<ul style="list-style-type: none"> Less nitrogen and phosphorus excreted in animal waste Food scraps from grocery stores and other farms can be recycled into cow feed instead of dumping in landfill 	<ul style="list-style-type: none"> Less costly to process More productive cows

Sample source links:

- Dairy Farmers of Wisconsin: www.WisconsinDairy.org
- Meet Our Farmers: www.WisconsinDairy.org/our-farms/our-farmers
- Our Cows: www.WisconsinDairy.org/Our-cows
- Sustainable Farming: www.WisconsinDairy.org/sustainability



What Is Sustainable Nutrition?

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.

Proposal	Pros	Cons
Reduce consumption of meat and dependency on animal-derived foods	<ul style="list-style-type: none">• Reduction of greenhouse gas emissions• More farmland available for crops	<ul style="list-style-type: none">• 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	<ul style="list-style-type: none">• Nutritional powerhouse• Can be tailored to regional environments (cows, goats, etc.) and scale of economy• Modern practices can reduce resource use and pollution	<ul style="list-style-type: none">• Communities may need training to properly care for animals• Local production overseas might impact U.S. exports

