

Why Ag in the Classroom?

Agriculture means survival. Over time, fewer and fewer people have close contact with farming and the total agricultural sector. They're not aware of their own and society's total dependence on agriculture. **People must be agriculturally literate in order to make responsible decisions affecting this giant lifeline.**

Teaching students to be agriculturally literate brings their learning to life. Helping students understand the farm-to-delivery connection is important in our consumer-driven society. That's what the student Minnesota AgMag Series is all about.

Integration Ideas

Social Studies

- Research the role that water and other natural resources have played throughout the history of Minnesota. Ideas include formation of cities, transportation, moving goods, power source for manufacturing, etc.
- Use the information on pages 7 to discuss the reasons that bring Hmong, East African, Hispanic, Asian, Indian, and other immigrants and refugees to Minnesota. Compare and contrast their experiences with earlier immigrant groups in the nineteenth century.

Science and Health

- Use the agricultural examples in the AgMag to focus on environmental science and natural resources.
- Use the information describing Variable Rate Technology used on the farms on pages 4-5 to discuss how technology can make farmers both more efficient and more environmentally sound.
- Windy Creek Acres (page 5) uses a wind turbine to generate power as well as a high-efficiency irrigation system to conserve and protect energy and water. Discuss with your students how the development of those technologies protects natural resources.
- Discuss how farmers and scientists work together. tr Shrimp (page 6) works with a scientist to monitor water quality for their shrimp. Discuss the role a scientist plays in this or other types of farming.
- Use the science and technology connections to agriculture on pages 7 to discuss the impact of STEM on food production and the agricultural industry.

Glossary

Some words in your AgMag may be unfamiliar to your students. These words often appear in bold type or in italics. Many are defined in the articles. Words you may wish to pre-teach are:

AQUACULTURE: The process of farming aquatic life, like fish and shrimp

AQUATIC: Of or relating to water, such as plants or animals that live in water

AQUIFERS: An underground layer of water-bearing permeable rock or materials such as gravel, sand, or silt from which groundwater can be extracted

BUFFERS: A strip of land with grass or natural vegetation along waterways, lakes, and rivers

CARBON: A chemical compound that is necessary for plants to live and grow

EVAPORATION: Process in which a liquid transforms into a gas

GROUNDWATER: Groundwater is the water found underground in aquifers

HYDROLOGY: The study of water as a science

IMMIGRANTS: A person who moves from one country to settle in another

IRRIGATION: The process of watering land via manmade mechanisms

NATURAL RESOURCES: Materials from the earth that humans use to consume or to make manmade products

PHOTOSYNTHESIS: The process used by plants to convert energy from the sun into chemical energy that supports the plants

PRECIPITATION: Rain, snow, sleet, or hail that falls from the sky to the ground

PRECISION FARMING:

Using digital software, drones, and GPS systems linked to satellites to help farms be more productive and exact when planting crops, managing weeds and pests, and harvesting.

RUNOFF: Water that moves so fast the land cannot absorb it

STEWARDS: People who manage or take care of things, including protecting the environment

SURFACE WATER: Water on the surface of the Earth, such as lakes, ponds, and streams

TRANSPIRATION: The process where moisture travels through a plant, with much of it eventually evaporating

VARIABLE RATE APPLICATION: A process in which technology is used to help farmers determine where specifically they do or do not need fertilizer or soil nutrients

Minnesota K-12 Academic Standards

Minnesota Academic Standards Connection

Subject	Standard Code	Benchmark
Social Studies	4.3.4.9.1	Explain how humans adapt to and/or modify the physical environment and how they are in turn affected by these adaptations and modifications.
Social Studies	6.3.3.6.1	Locate, identify, and describe major physical features in Minnesota; explain why physical features and the location of resources affect settlement and the growth of cities in Minnesota.
Social Studies	6.3.4.10.1	Describe how land was used during different time periods in Minnesota history; explain how and why land use has changed over time.
Social Studies	6.4.4.23.2	Identify the major Minnesota political figures, ideas and industries that have shaped or continue to shape Minnesota and the United States today.
Science	5.4.2.1.1	Describe a natural system in Minnesota, such as a wetland, prairie, or garden, in terms of the relationships among its living and nonliving parts as well as inputs and outputs.
Science	5.4.4.1.1	Give examples of beneficial and harmful human interaction with natural systems.

AgMag Cover (Social Studies, Science, Environmental Studies)

1. Just what are Minnesota's natural resources? Brainstorm a list; think about all the wonderful things that occupy our air, land, and water. Why is it necessary to protect these treasures? [\(Because we need them to live and grow; we need healthy air, soil, and water for crops and animals to grow; it's better for the earth\)](#)
2. What natural resources can you find in these pictures? (Water, air, plants)
3. Why do we say farmers are some of our most important environmentalists? (They manage such a large amount of land—nearly three-quarters of the land in Minnesota—so the ways they care for and protect resources are very important.)

Student Pages 2 and 3 (Social Studies, Science, Economics)

1. What are the different ways that water, soil, and air are important for agriculture? (Plants and animals need water to grow and survive; soil is needed to grow plants and provide them with nutrition, and is also home to other things like insects that are helpful for plants; clean air helps grow healthier plants)
2. How many ways do you use water each day? How much water do you use? (Showering, 5 gal/min; toilet flushing, 6 gal; brushing teeth, 2 gal; hand washing, 2 gal; automatic dishwasher, 15 gal/load; washing machine, 20-30 gal/load.) How could you save water in your daily activities?
3. Farmers do much more than just the listed activities to protect water and the environment. What are some other things they do? (Leave some land undisturbed to protect native plants and create wildlife habitat; plant trees as windbreaks to reduce soil erosion; use computer-based precision farming to manage planting, fertilizing, irrigation and crop protection applications, etc.)
4. What are some things you can do to keep the air clean? (Ride bikes or walk to places rather than ride in a car, or have several people ride in one vehicle together, like a school bus; use less electricity when possible, as generating electricity can cause air pollution; plant trees!)

Why Do Farmers Do These Things? Answers

(Accept other logical answers too)

1. Help keep pollution out of water supplies. **a, c, d, e, f, and h**
2. Help reduce loss of soil to wind or water erosion. **b, f, and g**
3. Conserve and protect water **a, b, c, d, e, f, g, h**
4. Help keep animal manure out of rivers, wetlands, and lakes **h**

Student Pages 4 and 5 (Science, Environmental Education)
Farmers Taking Care of Natural Resources

1. Why is the technology being used on these farms important? (They're using Variable Rate Application to determine where soil does or does not need fertilizers and soil nutrients, so they don't overuse them; they use GPS to manage water so heavy rains don't flood the fields; high-efficiency irrigation systems to avoid wasting water; buffers to protect waterways and prevent soil erosion; a wind turbine and solar panels to generate energy)
2. Why would farmers want to use these new technologies? (Protect natural resources; protect farmland; reduce power usage, collect information about the soil health and plant growth, efficiently use fertilizer and the minimum amount of pest and weed control products.)
3. How does using Variable Rate Technology help farmers? (They can be much more efficient with their use of fertilizers and soil nutrients, they have a better understanding of the health of the soil)

Think and Discuss:

How do farmers use Variable Rate Technology? (Analyze soil to see what nutrients are needed)

Why is it a valuable piece of technology? (Prevents overuse of chemicals in soil)

Why is it important for farmers to protect the air, soil, and water? (To keep them safe for everyone; to be able to most efficiently grow crops and raise livestock, so the farm can possibly be passed onto future generations)

Cause and Effect

Some potential answers:

Cause: Using Variable Rate Technology

Effect: Helps farmers efficiently use fertilizers and soil nutrients, avoiding overuse

Cause: Using wind turbines

Effect: Reduces energy dependence

Cause: Using high-efficiency irrigation systems and buffers

Effect: Reduce overuse of water, protect water, prevent soil erosion

Student Page 6 (Science, Social Studies, Health)

Grown in Minnesota: Shrimp

1. Why is it a good idea to grow shrimp in Minnesota rather than just bringing it in from the oceans? (Ocean pollution makes it hard for wild shrimp to grow and be healthy; seafood has been overfished in many areas, meaning there isn't as much growing as there used to be; reduces the carbon footprint for Midwesterners to have shrimp)
2. Why are the shrimp grown indoors? (Minnesota winters would freeze shrimp; it's easier to monitor and control the growing environment for the shrimp)
3. Why would Trish Shrimp want to have an employee who has studied environmental science and hydrology working on the farm? (She understands the science of water to help the shrimp grow safely and healthfully; she understands how the environment can affect the water and thus affect the shrimp)
4. Think about other kinds of foods that have not traditionally been grown in Minnesota. What would it take to grow them here? (Open-ended and could evolve into an activity—things like citrus fruits need warmer climates, could special growing buildings be developed to help grow them indoors here?)

Student Page 7 (Science, History, Social Studies)

1. How can the scientific and technological advances in agriculture benefit farmers? Consumers? (Farmers can be more efficient with their time. Some technology tools and advancements in crop production allow for lower levels of pesticides and herbicides to be used. Farmers are able to use science and research in seed and plant development to increase their yields (amount of the crop produced). The living conditions for livestock animals (temperature, light, space, etc.) can be optimized so the animals produce more milk, eggs, wool, etc. Consumers have a greater quantity and variety of food products to select from.)
2. Today Minnesota welcomes immigrants and refugees from Asia, Africa, Europe, Mexico, and many other countries. Regardless of where their journey began, these newcomers bring foods and traditions that enrich us all. What foods have you eaten that came to us from other countries? Think Mexico, China, Japan, Vietnam and other Southeast Asian countries, Somalia, and Europe. What foods did your ancestors bring from their homelands?
3. Why is it important for young people to be involved in agriculture and farming? (Agriculture is the giant lifeline that feeds, clothes, and shelters the world. Each generation depends on farmers to provide these things, all needed for survival.)
4. Imagine you want to be a farmer. What would you need to learn in order to run a farm? To grow crops? To raise livestock? Who could teach you these things? How would you get money to buy or rent land and equipment? (Many young people get their start in farming because they grow up in farm families, learning from parents and grandparents. They may take over family farms when older generations retire. High school and college courses help, too. The University of Minnesota and many other schools have programs for people who want to study agriculture or become farmers. See the University of Minnesota's College of Food, Agricultural and Natural Sciences [CFANS] at www.cfans.umn.edu. For a list of schools all around Minnesota offering courses in agriculture, natural resources and related fields, see www.schoolchoices.org/colleges/in/minnesota/field/1.)

Student Page 8

Food Sails Down the River

1. What are some reasons to ship food by boat? (A barge can carry much more food than a truck; it's less expensive than other forms of transportation; it's more environmentally friendly as boats use much less fuel and produce fewer emissions than trucks and trains)
2. Why do you think things like corn and sugarbeets can go by ship? (They store well and last long enough for a journey)
3. Optional activity: Have the students research how food is packed and stored on boats. Ask what they learned and what surprised them.

Activity answers: What Grows Where?

Sugarbeets: Minnesota and Mississippi Rivers

Wheat: Minnesota and Mississippi Rivers

Potatoes: Minnesota and Mississippi Rivers

Corn: Minnesota and Mississippi Rivers

Soybeans: Minnesota and Mississippi Rivers Lumber: St. Croix and St. Louis Rivers

Wild rice: Red Lake River

Hay: Mississippi River