

WHY AG IN THE CLASSROOM?

In times past, people were very aware of the role agriculture played in their lives. It meant survival! Nearly everyone - men, women and children - worked the land.

Agriculture still means survival. That will never change. But as time goes on, fewer and fewer people have close contact with farming. They're not aware of their own - and the nation's - total dependence on agriculture. Think about it:

- Less than two out of 100 Americans work in production agriculture (farming). This small group meets the food and fiber needs of the nation as well as many people abroad.
- Agriculture, along with its related occupations, is the nation's largest industry. It generates billions of dollars each year; one out of every five jobs depends on it in some way. It has massive impact on the American economy, greatly influences the U.S. international balance of trade and directly affects the number of jobs here at home.

Our citizens must be agriculturally literate in order to make responsible decisions affecting this giant lifeline. Building that literacy in tomorrow's leaders is what Ag in the Classroom is all about.

ACADEMIC STANDARDS CONNECTION

The student Minnesota AgMag and other educational materials from Minnesota Agriculture in the Classroom can meet many of

the academic standards. These materials can serve as a wonderful "real life" connection and supporting piece as you incorporate the standards into your classroom activities. Here are a few examples of potential connections:

SOCIAL STUDIES

(Geography Strand, Human Environment Interaction Sub-strand) Standard: Students will understand that the environment influences human actions and humans both adapt to and change the environment.

(Geography Strand, Human Environment Interaction Sub-strand) Standard: Students will understand the meaning, use, distribution and importance of resources changes over time.

SCIENCE

(Earth Science Strand, Human Interaction with Earth Systems Sub-strand) Standard: Students will understand that in order to maintain and improve their existence, humans interact with and influence Earth Systems.

(Life Science Strand, Interdependence among Living Systems Sub-strand) Standard: Students will understand that natural systems have many components that interact to maintain the living system.

LANGUAGE ARTS

(Reading Strand, Key Ideas and Details Sub-strand) Standard: Students will determine central ideas or themes of a text and analyze their development; summarize the key supporting details and ideas.

(Reading Strand, Integration of Knowledge and Ideas Sub-strand) Standard: Students will integrate and evaluate content presented in diverse media formats, including visually and quantitatively as well as in words.

HELLO OUT THERE (Resources)

MINNESOTA AGRICULTURE IN THE CLASSROOM

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MAITC has great free educational resources. Try these!

- Agriculture: Serving Science and Society (34 online video stories)
- Food for Thought geography mapping curriculum
- Full-color Minnesota Commodity Card Series (20 cards)
- Farm Animal bookmarks and other supplemental resources
- AgMag Jr. for your primary grade colleagues to use



Interactive AgMag Now Available!
Check it out at
AgMagOnline.com

Check out these websites to enhance AgMag Issue 3 content:

Minnesota Land and Water Resources



www.mda.state.mn.us/protecting.aspx
www.dnr.state.mn.us/waters/index.html
www.pca.state.mn.us/water/basins/
www.dnr.state.mn.us/snas/naturalhistory.html

Gardening/Plants



www.mg.umn.edu
www.mnla.biz/
www.mda.state.mn.us/mngrown
www.arboretum.umn.edu/childrengarden.aspx
www.kidsgardening.com
www.garden.org
www.mn-farmentoschool.umn.edu

MINNESOTA HISTORICAL SOCIETY

For great Minnesota historical images go to the Society's Photo and Art Database at:
www.mnhs.org/collections

To enhance Agriculture's Biggest Leaps (AgMag page 7) access the Agricultural Mechanization Timeline at:
www.greatachievements.org/?id=3725

ABOUT YOUR AGMAG

Your AgMag is distributed primarily to teachers in grades studying Minnesota (usually fourth or sixth). If the magazine fits better into the curriculum program at another grade level, we encourage you to pass the material on to the appropriate teachers. Offered at no cost to you, the AgMag is a product of Minnesota Agriculture in the Classroom. Here is your third and final Minnesota Agriculture Magazine for the 2011- 2012 school year. This issue of your AgMag is designed to help you:

- provide students with a base of information for identifying and understanding the connections between agriculture and natural resources
- foster a stewardship ethic toward land, water and air
- develop awareness of Minnesota's water resources and water pollution challenges
- encourage students to develop home, school or community gardens
- build awareness of incorporating local foods into school lunches
- offer a glimpse of a modern Minnesota family dairy farm
- highlight significant achievements in agricultural engineering over the past 100 years

INTEGRATION

Experienced classroom teachers create your AgMag materials. An Editorial Review Committee of teachers and subject matter experts provides content ideas and reviews each issue for accuracy and relevance.

Some teachers use the magazine as a separate lesson; others integrate magazine content into specific areas of the curriculum. The subject matter and skills listed will help you select appropriate AgMag activities to integrate into other curriculum areas.

Language Arts, Reading: Use the articles and activities to develop a variety of skills: outlining, reading for the main idea, vocabulary development and spelling words (bold words).

Social Studies: After reading pages 2 and 3, invite students to tell about things they are doing to help the environment. Encourage ideas about things they would like to study or projects they would like to take on to further help and understand the environment. See pages 4 and 5 for community and school gardening activities. See page 6 to meet the Kuball family, dairy farmers in Minnesota and page 7 for technology impacts on farmers.

Geography: See map and related activities on page 8 in the AgMag.

Science, Environmental Education, Health: The entire AgMag is directed toward environmental education. Pages 2 and 3 focus on natural resources. See pages 4 and 5 for science, nutrition and technology in creating gardens. The Kuball farm article on page 6 also incorporates science, environmental education and health.

History: Page 7 offers some highlights in agricultural engineering over the past 100 years.

Math: See Home Connection, page 8.

IN THIS GUIDE: DON'T MISS

- SHOW WHAT YOU KNOW pretest and post-test on page 6. Check your students' knowledge of key agricultural concepts before and after reading the AgMag.
- Discussion prompts, background information, extended activities and answers.
- Reproducible activities designed to increase understanding of Minnesota's water resources on page 4 and farming history on page 5.

GLOSSARY

Each AgMag contains several words that may be unfamiliar to your students. You may wish to preteach these words, or take time to define them as they appear throughout the magazine. In most cases, the words appear in bold type and/or are defined in the magazine. Highlighted words in this issue are: **natural resources, aquatic** (cover); **surface water, groundwater, hydrologic cycle, percolates, aquifers, photosynthesis** (pages 2 and 3); **self-propelled combines, irrigation, biofuels, biomass** (page 7).

DISCUSSION PROMPTERS

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. Don't forget people!*) Why is it necessary to protect these treasures?
2. What natural resources can you find in these pictures? (*Water, soil, air, trees, frog, fish and plants.*)
What connections to agriculture do you see? (*Clothing, oar, trees, turf grass and water.*)
3. Why do we say farmers are some of our most important environmentalists? (*They manage such a large amount of land—over 46% nationally—so the ways they care for and protect resources are very important.*)

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

1. 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?
2. Minnesota is richly blessed with water resources, but easy access to usable water varies across the state. Why might one well hit water at 30 feet and another might not reach water until 75 feet or more? (*It depends on the distance water is from the surface of the earth. The depth of aquifers and usable groundwater varies.*)
3. What are some challenges to our water resources? (*Growing population; greater per capita water use; industry and agricultural needs; excessive suburban water use; development decisions like cutting trees; animal and human activities around shorelines; trash or pollution, years with low rainfall or little snow, etc.*)

AgMag Pages 4 and 5 (Science, Social Studies)

1. School and community gardens are popular all across Minnesota. What are some of the reasons you would want to grow a garden? What are some of the reasons you may not want to? What would it take for kids to have a successful garden in your area? A challenge for school and community gardens is that most of the growing season occurs during the summer months when students are not in school. How might you cover the needs and responsibilities of a garden when school is closed?
2. On Dec. 2, 2010, Congress signed into law the first (big) improvements to child nutrition and school lunches. The new law means funding for healthier meals. It means rules to kick junk food out of school vending machines. It means \$50 million for Farm-to-School programs. Many schools have already made improvements. Have you seen any changes in your own cafeteria?
3. Check out the websites in the AgMag and in this Teacher Guide (page 1) for a host of garden-related information and activities.

1. The first Kuballs started with a diversified farm. Since 1964, the family has specialized in dairy. What are the differences? *(The diversified farm produces a variety of crops or animals or a mix of both. Diversified farmers can usually adjust better to the ups and downs of changing markets since they have different products. But producing multiple products requires a wide range of knowledge, equipment and labor. The specialized farm has one main crop or animal product. Specialized farmers are deeply affected by the up and down prices of their specific commodity. Because they focus on one product, they are more able to gain the knowledge, equipment and labor efficiency to produce high volume crops or livestock.)*
2. The Kuballs raise corn and hay, but buy things like cotton seed, linseed meal, soybean meal, etc. to blend into their animal food ration. Why? *(Cows are much healthier and produce more milk with good, balanced nutrition. It is not possible for farmers to grow all the nutrients their animals need.)*
3. Early farmers milked cows by hand into pails and hauled their milk to the creamery in milk cans. Today the milk is never touched by human hands. It goes directly from the cow through the milking machine and a pipeline into a cooled bulk tank. A tank truck hauls it to the processing plant, where each load is tested for quality, filtered and pasteurized. How does modern milking help protect consumers' health? *(Clean equipment, careful temperature control, frequent testing and pasteurization all control bacteria and contribute to a fresh, healthy product.)*

The agricultural achievements on this page were selected by agricultural engineers. People from other segments of agriculture may have included other achievements; this list highlights significant agricultural science and technology advances.

1. Why do you think the engineers selected the tractor as the biggest ag achievement of all? *(Tractors turn farm handwork into machine work. They speed up almost every job on the farm and do so many different jobs. They pull machinery that tills, plants, fertilizes, cultivates, bales, rakes and harvests crops, pull wagons of produce, stretch wire for fences, carry supplies, move cattle feed and other heavy loads, clean barns, plow snow and so much more. Many farmers never go a day without using their tractors.)*
2. How do each of these professionals bring progress and change to today's farms? Veterinarians? *(Animal care, health and welfare);* Plant scientists? *(Advice on what to plant where, new plant varieties with higher yields or that resist pests, drought, etc.);* Farm equipment builders? *(New and better equipment to do the work, safety shields and equipment designs to help prevent injuries);* Computer specialists? *(Programs to manage land, crops, animal care, farm financial records, herd health and production data, market information and much more.)*

ANSWERS: AgMag

Please Note: *If answers are supplied in the AgMag itself, they are not repeated here.*

NATURAL RESOURCES. (Cover)

Water, sun and soil are natural resources. People, trees, plants and animals are also resources.

CARE FOR THE WATER, p. 2

Did you know?

250 gallons of water equals one ton.

CARE FOR THE SOIL, p. 3

soil

THINGS TO THINK ABOUT, pgs. 4 and 5

Things to think about in growing a garden:

Space, soil, moisture, sun, tools and supplies, people committed to maintaining the garden: tilling, planting, weeding, harvesting, etc.

A FAMILY FARM, p. 6

The national trend has been for farms to get larger. Larger farms are able to produce more crops and grow more livestock. That means more income for the farmer.

WHAT DO YOU THINK, p. 7

The main reason each new invention was created was to speed up tasks and to save human labor.

THE TOP SIX, p. 7

1. tractor;
2. rural electrification;
3. combine;
4. milking machine;
5. cotton picker;
6. conservation tillage.

CELEBRATE MINNESOTA WATER, p. 8

- | | |
|----------------|--------------|
| 1. Red | 5. St. Croix |
| 2. Rainy | 6. Rum |
| 3. Mississippi | 7. Minnesota |
| 4. St. Louis | 8. Root |

WHAT IS ARBOR DAY?, p. 8

Arbor Day is a day set aside each year to honor and plant trees. US National Arbor Day is the last Friday in April. Minnesota and 27 other states celebrate that same day. Other states have different days depending on their growing season. Many other countries have tree celebrations and planting days, too. Minnesota Arbor Day 2012 is April 27. (Earth Day, another annual environmental event, is April 22 each year.)

ANSWERS: Teacher Guide

ARE YOU WATERWISE?, p. 4

Across: 1.rain; 2. glaciers; 3. aquifers; 4. groundwater

Down: 1.gas; 2. fertilizer; 3. surfacewater 4. pollution; 5. agriculture

Minnesota's water borders include the Red, Rainy, Mississippi, St. Louis, Bois de Sioux, Pigeon and St. Croix Rivers and Lake Superior. Our borders with Canada also include boundary waters.

THEN & NOW!, p. 5

How has the difference affected farming?

1. Farmers pay much more to buy land.
2. With milking machines, farmers can milk many more cows. Larger herds mean more income.
3. Modern machines do much more work in much less time. Fewer human workers are needed and there is much less hard physical labor.
4. Milk prices are higher but they have not increased at the same rate as land, equipment and other costs.
5. Total herd production is higher. More milk means more income.
6. Feed costs have increased.
7. Minimum tillage helps prevent water and wind erosion, control weeds and more.
8. Instant, complete and up-to-date records help farmers manage their farm and their work much more efficiently.

Dairy herds are larger now.

With larger farms, farmers have larger herds.

Cows give more milk today because of better breeding, nutrition and health care. They are also kept more comfortable with better living conditions. The farmer receives about \$1.20 to \$1.40 per gallon for milk.

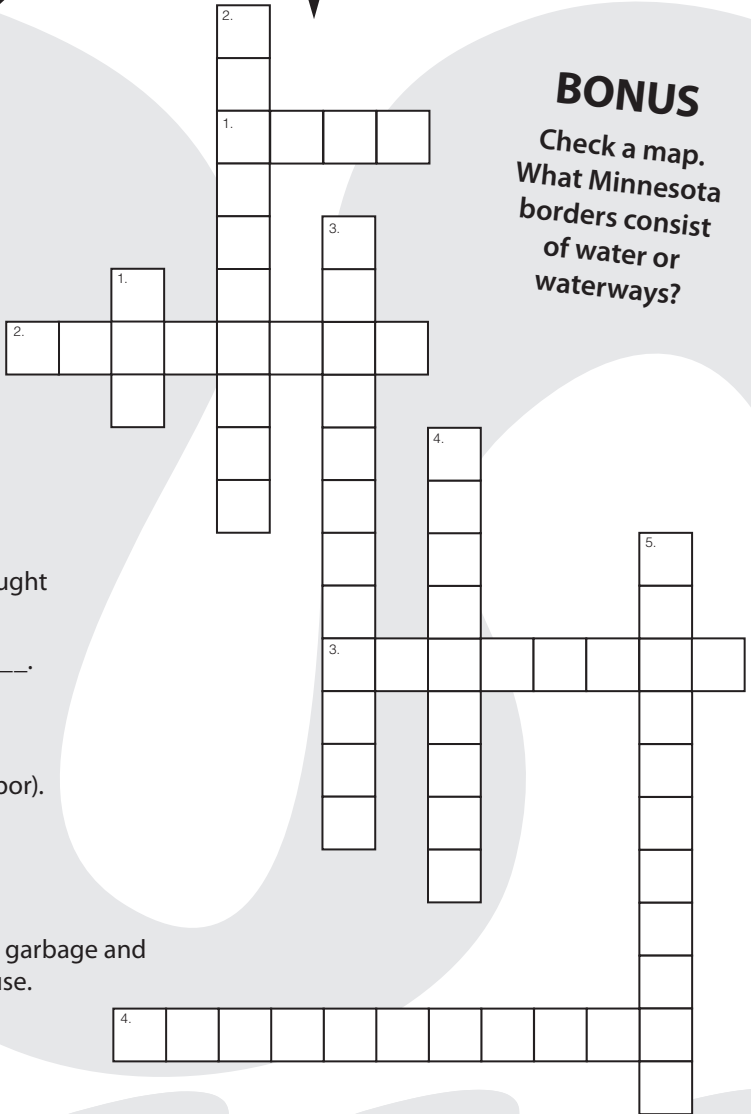
SHOW WHAT YOU KNOW!, p. 6

1. b; 2. c; 3. b; 4. a; 5. b;
6. d; 7. a; 8. c; 9. d; 10. a.

Are You WATER WISE?



BONUS
Check a map.
What Minnesota
borders consist
of water or
waterways?



Across

1. Forms of precipitation include hail, sleet, snow and _____.
2. The _____ in Minnesota eons ago affected our state's soils and water supplies.
3. Underground spaces in rock, sand or gravel where water is caught and held are called _____.
4. Water located in underground cracks and spaces is called _____.

Down

1. The three forms of water are liquid, solid (ice) and _____ (vapor).
2. Material used to improve the soil and grow better plants is called _____. It can contaminate water.
3. Water in lakes, streams, rivers and wetlands is called _____.
4. Water _____ happens when things like gasoline, chemicals, garbage and animal waste get into the water, making it unsafe for human use.
5. This food-producing industry depends on Minnesota's groundwater.

KIDS can take care of groundwater, too!

Groundwater is a big part of our high quality of life in Minnesota. Let's all take care of it!

1. Investigate your home for products (paints, motor oil, cleaners, old medicines, etc.) that could contaminate the groundwater if poured down the drain or dumped on the ground. Mark all these containers as dangerous. Better yet, set them aside for donation at the next "household hazardous waste collection day" in your community.
2. Tell others how hazardous products can contaminate the groundwater when thrown into the trash.
3. Use environmentally friendly products instead of hazardous ones. Find recipes for homemade cleaners using less toxic ingredients like vinegar and baking soda.
4. Design posters to spread the word about groundwater protection. Ask a local grocery store, library, school or department store to display them.
5. Host a school-wide groundwater education day.

Little things add up to **BIG DIFFERENCES!**

Then & NOW

Then*			Now*	How has the difference affected farming?	
1.	1902	Agricultural land price per acre	\$100	\$3500 and up	
2.	1902	Milking systems	Cows milked by hand	Cows milked by machine	
3.	1902	Equipment powered by	Horses	Modern machines and fuels	
4.	1960	Milk prices paid to the farmer (for 100 lbs, about 12 gallons)	\$9 – \$10	\$15 – \$18	
5.	1960	Average daily milk produced, per cow	40 – 50 lbs	70 – 80+ lbs	
6.	1960	Feed costs (100 lbs)	\$6 – \$7	\$8 – \$10	
7.	1960	Tillage	Soil turned completely over and left exposed to wind and water erosion	Minimum and conservation tillage	
8.	1960	Farm, field and animal records	Kept by hand	Computerized (with farm apps)	

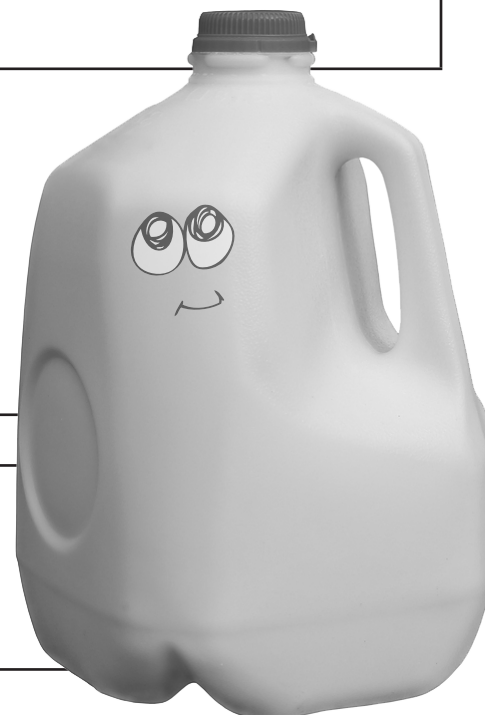
* All figures are rounded off and approximate. Land prices vary by region and agricultural quality.

Are dairy herds generally larger or smaller now? Why?

How does farm size affect herd size?

What might be some reasons cows give more milk today than they did 50 years ago?

	\$	Why is there such a difference?
About how much money does the farmer receive for a gallon of milk?		
About how much do you pay at the store for a gallon of milk?		



Note to Teachers:

You are encouraged to send the Pretest and Post-test results to Ag in the Classroom to help document student learning. Use the attached postage-paid evaluation card.

Name _____

Check one Pretest Post-test

SHOW WHAT YOU KNOW!

Take this short quiz before you read your AgMag, then again after reading the magazine. See the improvement!

1.

Water pumped from wells comes from

- a. underground pipes to the nearest river.
- b. aquifers.
- c. water factories.

2.

Two main natural resources affected by agriculture are

- a. iron ore and minerals.
- b. air and natural gas.
- c. soil and water.

3.

Minnesota schools and farms are teaming up to bring more

- a. animals into schools for hands-on learning.
- b. locally grown foods to school lunch programs.
- c. awareness of hydroponic crops.

4.

The water we use today is the same water that was here when dinosaurs roamed the earth.

- a. True
- b. False

5.

Nearly three-fourths of the land in Minnesota is owned by

- a. Native Americans.
- b. farmers and other private landowners.
- c. banks.

6.

Trees and plants help the environment by

- a. releasing oxygen.
- b. holding soil.
- c. providing habitat for animals.
- d. a, b, and c.

7.

The fall of 2011 was

- a. the driest in Minnesota's modern history.
- b. the wettest in Minnesota's modern history.
- c. the snowiest in Minnesota's modern history.

8.

Biofuels

- a. add to air pollution.
- b. are the main ingredient in gasoline.
- c. are made from corn, soybeans, sugarcane, grass and more.

9.

By protecting soil and water, we protect

- a. wildlife.
- b. the human food supply.
- c. trees and plants.
- d. a, b, and c.

10.

All the water we drink or use falls on the earth first.

- a. True
- b. False