AgMag 4

Agriculture: Helping you every day!

Minnesota Agriculture in the Classroom

Teacher's Guide Fall 2020-2021

Why Ag in the Classroom?

Agriculture means survival. Over time, fewer and fewer people have been in close contact with **farming** and the 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-table connection is important in our consumer-driven society. That's what the student Minnesota AgMag Series is all about.

About Your AgMag

The AgMag is a great supplement to your social studies, science, or language arts curriculum. The AgMag also includes the study of Minnesota history and geography. You'll get three issues per school year: October, January, and March.

AgMag Theme: **Agriculture is Everywhere!**

- Overview of agriculture
- The three segments of agriculture
- Agricultural careers
- Major Minnesota agriculture **crops**/growing areas
- Rainfall
- State symbols and agriculture
- Minnesota History: Minnesota's early **farmers** from ancient days to 1900

Integration Ideas

Social Studies

- Investigate how Minnesota land has changed over time. Challenge students to find historical accounts and photos.
- Find additional maps. A good source is the Food for Thought geography resource at http://minnesota.agclassroom.org/educator/fft.cfm

English Language Arts

- Ask students to identify key ideas and details and build their vocabulary through the AgMag's informational text.
- Use agriculture as an inspiration for creative writing activities and group discussions. Ideas: trace family history to agriculture roots, life in an early Native American village or on a settler's farm.

Science and Math

- Use the “Science in Agriculture” article to draw connections between agriculture and science.

Glossary

Some words in your AgMag may be unfamiliar to your students. Many are defined in the articles. There is also a glossary on the AgMag website: http://mnagmag.org/glossary/ Words you might wish to pre-teach are:

AGRICULTURE: Growing plants and raising animals that people use for food, clothing and many other things every day. It's also harvesting those farm products and getting them to us so we can use them. Agriculture is the **industry** that grows, harvests, processes, and brings us food, **fiber**, fish, forests, sod, **landscaping materials**, and more. It uses soil, water, sun, and air to produce its products. The process starts on farms, **orchards**, gardens, and ranches with the growing and the harvesting of crops and **livestock**, then moves to **processing** plants before finally traveling as finished products to stores, farm markets, lumberyards, greenhouses, and more where **consumers** buy the products. Agriculture is connected in some way with almost everything we eat, wear, and use.

Quote from an unknown source: "Agriculture is not simply farming. It's the supermarket, the equipment factory, the trucking system, the overseas shipping industry, the scientist's laboratory, the houses we live in, and much more. It has an effect on the air we breathe, the ground we walk on, the water we drink, and the food we eat."

ACRE: an acre is an area of land that is 43,560 square feet.

BUSHEL: a measure of capacity equal to 64 US pints (equivalent to 35.2 liters), used for dry goods. For wheat, one bushel equals 60 pounds of wheat or approximately one million wheat kernels. A common semi-truck grain hopper can hold approximately 1,000 bushels of wheat – or 60,000 pounds of wheat in a single load.

CLIMATE: The long-term patterns of weather in a particular area or region. Temperature, air pressure, humidity, **precipitation**, sunshine, cloudiness, and wind all impact the climate.

CULTIVATE: To cultivate is to nurture and help grow. Wild rice is grown in the wild, whereas cultivated wild rice is grown under regulated conditions in man-made paddies and is usually what is sold in supermarkets.

CULVERT: A culvert is a structure that allows water to flow under a road, field, or similar obstruction from one side to the other. Typically embedded so as to be surrounded by soil, a culvert may be made from a pipe, reinforced concrete or other material.

DISTRIBUTION: Getting products from farms to consumers.

FIBER: The raw material from plants and animals, like cotton and wool, which are used to make cloth, rope, and more.

GROWING SEASON: Period of the year that is warm enough for plants to grow.

LIVESTOCK: Farm animals (including poultry) raised for food, clothing, and other products or uses.

INDUSTRY: The businesses, organizations and people that provide a particular product or service.

INPUTS: The materials, time, and money required so a business/farm/entity can function.

LANDSCAPING MATERIALS: Vegetative materials such as trees, shrubs, perennial plants, and annual plants used to decorate the outside of a home, business, or outdoor area.

OUTPUTS: The amount of something produced by a person, machine, or industry. For farmers, outputs are things like crops or livestock.

PLANT BREEDER: A scientist who focuses on changing the traits of plants in order to produce desired characteristics.

SOIL TYPES: Soils are differentiated by the amount of sand, silt, and clay particles present. This is called soil texture. The soil texture affects the soil's ability to hold moisture, **nutrients**, and air. These factors influence the conditions needed for plant growth.

PRECIPITATION: Rain and snow.

PROCESSING: Changing **raw materials** into many different things.

PRODUCTION: Growing and harvesting plants or raising farm animals.

TERRAIN: The physical features of an area including elevation, slope, vegetation, and surface material. Terrain affects water movement and drainage characteristics, and it can also affect weather and climate patterns.
TRAIT: A distinguishing characteristic or quality.

TURF: The upper surface of soil that is made up of grass and plant roots.

Minnesota Academic Standards Connection

Subject	Standard Code	Benchmark
Social Studies	4.3.4.10.2	Analyze the impact of geographic factors on the development of modern agricultural regions in Minnesota and the United States.
Social Studies	4.2.3.3.1	Define the productivity of a resource and describe ways to increase it. For example: Productivity equals the amount of output divided by the amount of input (resource). Things that can increase productivity—division of labor, specialization, improvements in technology (the way things are made). The productivity of a corn farmer (resource) has been improved by the use of specialized equipment, development of new varieties of seeds and fertilizers and improved farming techniques.
Science	4L.4.2.1.2	Obtain information from various media sources to determine that plants and animals have traits inherited from parents and that variation of these traits exists in a group of similar organisms.** (P: 8, CC: 1, CI: LS3) Emphasis of the practice is to compare and/or combine information across texts and other reliable media. Emphasis is on organisms other than humans and the patterns in traits between offspring and their parents or among siblings.
Science	4E.4.2.2.1	Obtain and combine multiple sources of information about ways individual communities, including Minnesota American Indian Tribes and communities and other cultures, use evidence and scientific principles to make decisions about the uses of Earth's resources.* (P: 8, CC: 4, CI: ESS3, ETS1) Examples of cultures may include those within the local context of the learning community and within the context of Minnesota . Examples may include balancing the water, soil, wildlife, plant, and human needs to support sustainable use of resources.
English Language Arts	4.2.3.3	Explain events, procedures, ideas or concepts in a historical, scientific or technical text, including what happened and why based on specific information in the text.

AgMag Cover - **Agricultrue is Everywhere!**

Discussion Prompters

1. **Agriculture is everywhere.** What are the agriculture connections on this page? (Soap, food, paper, tires, clothes). Can you think of any other examples of how you've connected with agriculture today?

2. **Why is it important for all people to know about agriculture?** (We all depend on agriculture for food, clothing, and shelter. It's important to understand how our needs are supplied as we make decisions about using land, protecting resources, keeping food safe, and much more.)

AgMag Page 2 - **What is Agriculture?**

What is Agriculture?

Discussion Prompters

1. What have you eaten or worn today that came from an animal? A tree or plant? The soil? Which came from beef or dairy cattle? Hogs? Poultry?

2. Why do we say agriculture depends on **natural and renewable resources**? (The things that are produced, processed, and distributed all are dependent on soil, sun, air, and water in some way. Animals and plants are considered renewable resources.)

Minnesota Grown

Discussion Prompters

1. Why is soil type important for farming? Different plants require different types of soil to grow. Because Minnesota has areas with such diverse types of soils, Minnesota is able to be a top grower of many different kinds of crops. The crops are listed in the word search.

2. Minnesota is in the top 5 states for producing hogs, green peas, sweet corn, soybeans, spring wheat and barley. Have you ever seen any of these crops growing? What did they look like?

Fun Facts!

Discussion Prompters

1. What is Minnesota the #1 producer of? (Students can find answers in the text)
2. Aside from farmers, what types of jobs or careers can you think of that are a part of agriculture?

Activity

Word Search Answer Key:

AgMag Page 3 - **What Grows Where?**

(Geography and Map Skills Focus, Social Studies Standard 4.3.4.10.2)

What Grows Where

Discussion Prompters

1. What geographical features of Minnesota make it a good state for agriculture? (Variety of terrain and soil types, climate, rainfall, weather.)

2. What makes the Red River Valley (Northwest area) such a high-producing crop area? (Rich, fertile soils, adequate moisture, large flat areas for mechanized agriculture.)

3. Which of the four regions has a main crop that people may not always think of as agriculture? Explain your answer. (The Northeast area. In the past, natural forests were cut down and not replanted. Today, forests are replenished and trees are considered a renewable crop.)

4. In what weather situations can farmers do things to protect their crops and animals? (Farmers carefully plan when to plant crops to avoid weather that is too cold or wet. They might irrigate crops during dry conditions. They harvest ripe crops quickly to avoid damage to crops that can be harmed by fall frosts. They control the temperature in animal barns and shelter animals from inclement weather.) When do they have no control at all? (Violent winds and hail, extreme heat and drought, flooding, wildfires, late spring and early fall frosts, etc. are all beyond human control.)

5. Discuss annual precipitation as an average of data collected over many years. Remind students of weather events such as drought and flooding. What effect do these have on farmers? How could deviations eventually impact our food supplies and prices?

Minnesota Grown answers:

1. B
2. D
3. C
4. A

Minnesota Rainfall answers:

1. Northwest and Southwest gets the least rainfall. The Central and Northeast gets the most.
2. Specific crops need different amounts of moisture.
3. Above normal: Crops drown out or wash away. Yield is reduced.
   Below normal: Drought causes crops to wither or die. Yield is reduced.
4. - Hay and Pastureland: Central/Southeast growing region,
   - Sugarbeets: Northwest growing region,
   - Corn and Soybeans: Southwest growing region,
   - Forest and Pine Trees: Northeast growing region,
   - Wheat: Northwest growing region

AgMag Page 4 and 5 - **Farming Across Minnesota**

Today's farmers and Agriculture experts in Minnesota each have unique backgrounds that have led them to agriculture. This section is meant to introduce that concept to your students. From crop farmers to plant breeders, there are connections to agriculture everywhere. What they all have in common is their love of growing plants and providing better ways to produce and protect the resources they are in charge of. They also have a lot of knowledge about science, engineering, and technology in order to successfully grow these crops. Today they are educated in how to sustainably farm to keep farmland healthy for years to come.

Page 4 - **Wild Rice Grower**

(Earth Science Focus, Science Standard 4E.4.2.2.1)

Discussion Prompters

Pre Reading Prompts:

1. Have you ever had wild rice? How is it different from white or brown rice? What dishes have you had wild rice in?
2. What is a tradition? Why is it important to remember traditions that are important to us?

Post Reading Prompts:

1. How is growing wild rice unique from what we typically think of when growing plants?
2. What role does water play in growing wild rice? What happens if the water isn't carefully controlled?
3. How is Roland managing and taking care of his resources when growing wild rice?
4. After reading, refer students to page 3 (What goes Where). In what growing region would rice farming be most successful? Why?

Additional Content and Ideas:

The White Earth band is a Native American band of Ojibwe located in Northwestern Minnesota. They are based in the White Earth Indian Reservation and are the largest reservation by area in Minnesota. Consider having your students research and learn more about this Minnesota tribe. A few good resources are found in the websites below:

http://realwildrice.com/
https://whiteearth.com/history

In August during the wild rice harvest we plan to film Roland and the harvest process. Until then this is a great resource that shows planting and harvesting of wild rice in Minnesota:

https://www.youtube.com/watch?v=pCJO-kf0X2U

AgMag Page 5 - **Crop Farmer**

(Economics Focus, Social Studies Standard 4.2.3.3.1)

Pre Reading:

It is important that your students understand what "inputs" and "outputs" are. Before reading this farmer profile, make sure to go over these words with your students. It may be helpful to make a "T" chart and go over the definition and give different examples of both inputs and outputs.

Example:

Inputs	Outputs
Time it takes to plant	The fruit/vegetables grown that season
Food for animals	The growth/health of the animals
Money to buy seeds	The health of the field/crops

Discussion Prompts

1. How has Brian used technology to make his farm more efficient?
2. Why would Brian want to lower his inputs?
3. What does soil health have to do with farming? Why is it important?

Think and Discuss:

- If you were going to start a farm, which growing area would you select to farm in? What would you grow on your farm?
- What could you grow if you lived in the Northeast growing area? (Deciduous trees and some pines, which are made into lumber, paper, landscaping, Christmas trees, and maple trees, which provide sap for maple syrup)
- Why do you think the Northeast Area's main crop is forests, not field crops? (Short growing season, terrain that's rocky and sandy, heavily forested)
- Why is the Southwest Growing Area so good for farming crops? (Longer growing season, flat land where large farm machinery can operate, rich soil)

Activity Idea:

Assign students to work in pairs. Have them read the article and make a list of ways that Brian has been able to lower his inputs. Have them fill out an "If/then" worksheet (If Brian makes sure his soil is healthy, then his plants will grow better, etc.) filling out as many examples as they can from the article.

AgMag Page 6 - **Science in Agriculture**

(Life Science Focus, Science Standard 1 4L.4.2.1.2)

Background Information

Students may have never heard of a plant breeder. Briefly explain to them that plant breeders are scientists. They study a plant's characteristics and work to improve those characteristics that are most desirable like size, color, taste, etc. Some of our favorite fruits and vegetables today are the direct result of the work that plant breeders do.

This article has great examples of fruit/vegetables that have been created because of plant breeders. https://www.sciencealert.com/fruits-vegetables-before-domestication-photos-genetically-modified-food-natural

Do potatoes produce seeds?
In the article it was discussed how potato breeders like Cari use potato seeds to create a new breed of potato, but most people grow potatoes from a seed potato. The term "seed potato" is actually a misnomer and a bit confusing when, in fact, it is actually a tuber and not a seed that is planted. So, why aren't potato seeds used to grow potatoes in your garden?

Potato plants produce small green fruits (berries) filled with hundreds of seeds and about the size of a cherry tomato (see picture 3 under process of breeding a new potato) and with much the same appearance. While potatoes grown from "seed potatoes" produce an exact genetic clone of the mother plant, those grown from true potato seed are not clones and will have different characteristics than the parent plant.

That is why true potato seed is most often used by plant breeders like Cari to create a new breed of potato. Potatoes grown on commercial farms or in a garden are hybrids selected for their disease resistance or high yields that can only be passed on through "seed potato."

Discussion Prompts:

1. Why is potato breeding necessary?
2. Why do we need potatoes that are easier to grow?

Activity Idea:

Brainstorm positive and negative effects in the process of growing/breeding potatoes. Then **create a board game** beginning with an old looking/bad tasting cartoon potato at the start and ending with a new, fresh looking potato at the end. Along the way, drought, flooding, insects, bad taste, or perfect rainfall, sunshine, etc. move the players back spaces or along the path to 'breeding the perfect potato' the end of the game.
Teacher resource: https://www.sciencemag.org/news/2019/02/spud-s-you-breeding-revolution-could-unleash-potential-potato

Activity Idea:

Potatoes are just one example of the many plants that scientists and plant breeders focus on. Apples are a popular food grown in Minnesota that plant breeders have been working on for many years. Thanks to plant breeders at the U of M we get to enjoy Honeycrisp, SweeTango and First Kiss apples.

If you were an apple breeder, what traits would you breed for?
(Include pictures of different types of apples with a few traits underneath each one)

- Instructions would include having them pick two types of apples, indicating what they are breeding apples for.
- Have them fill in what trait they are wanting and why.

AgMag Page 7 - **Farming in a Glove**

Background Information

Farming in a glove is a great activity that allows students to be active participants in the growing process of seeds. This activity also gives them the opportunity to observe and understand how seeds become plants, what seeds need to thrive, and how much work and responsibility is required to ensure the seed grows successfully.

What do seeds need to grow? (water, food (nutrients), air, light)

Activity Instructions

1. Instruct students to write their name on the palm section of a clear plastic glove with a permanent marker. Also label each finger with a different type of seed.

2. Dip five cotton balls in water. Give each cotton ball 3 flat squeezes to wring out excess water.

3. Place 2 seeds on a small paper plate or paper towel and pick up with a moistened cotton ball.

4. Put the cotton ball with the seeds attached into the matching labeled finger in your glove.
    - **Teacher Tip:** You may need to use a pencil to get the cotton ball all the way to the tips of the glove fingers. Also, for large seeds like squash, use only two seeds.

5. Repeat steps three and four with the additional cotton balls and seeds.

6. Tape the glove to a window, chalkboard, or wall. A clothesline can also be used with clothespins holding the gloves on the line.

7. Depending on what seeds are used, germination will take place in 3-5 days. The cotton balls should stay moist through germination. If one or more appear dry you can add a little water with an eyedropper or spray bottle. Germinated seeds can be transplanted in 1-2 weeks.
    - If you'd like to extend this activity further, once the seeds have germinated, cut the tip off each finger and pull out the germinated seeds (cotton ball and all), and transplant into a container with soil (paper cups, gallon jugs, plastic containers are all great options for containers)

Additional Online Resources for Farming in a Glove:

- Step by step "How to" for farming in a glove using corn seeds with images and instructions https://agclassroomstore.com/farming-in-a-glove-corn-seeds/

- This activity has been adapted from the Three Sisters Garden. To refer to more information and additional enriching activities that could go along with this activity, visit: Instructions for farming in a glove - https://minnesota.agclassroom.org/teacher/matrix/lessonplan.cfm?lpid=66&author_state=0&search_term_lp=farming%20in%20a%20glove

- This is a great video that shows and explains how to do a farm in a glove. (Great for visual learners or for students who are doing this activity independently or at home) https://www.youtube.com/watch?v=Rwg81rzloLA&feature=youtu.be

AgMag Page 8 - **State Symbols and Agriculture**

Discussion Prompters

1. How do symbols communicate ideas more quickly than written words?
2. What is meant by the old saying, "A picture is worth a thousand words"?
3. What are some slogans or sayings that represent Minnesota? ("Land of 10,000 Lakes," "the Gopher State," "the North Star State," or the "Star of the North")
4. Take the Minnesota State Symbols game quiz on the Minnesota House of Representatives website: http://www.house.leg.state.mn.us/hinfo/StateFair3/

Additional information about state symbols:

Wild rice is hand-harvested in lakes and marshes. Cultivated wild rice is planted in water-filled paddies and harvested by machines.

Honeycrisp apples were developed at the University of Minnesota by apple breeders. Apple breeders do similar scientific work as Cari Schmitz Carley, the potato breeder featured on page 6.

Red (Norway) pine trees live an average of 250 years.

Did You Know? Rusty Patched Bumblebee
For additional information on the Rusty patched Bumblebee, check out this article:
https://www.mprnews.org/story/2019/05/31/bombus-affinis-meet-the-rusty-patched-bumblebee-new-state-bee-minnesota

Name the Symbol Answers:

State Flower: Pink and white lady slippers
State Bird: Common Loon
State Fish: Walleye