MINNESOTA
Agriculture in the Classroom

# AgMag 4 Fall Teacher's Guide

Started in 1985, the Minnesota Agriculture in the Classroom program (MAITC), is a unique public/private partnership between the Minnesota Department of Agriculture and the MAITC Foundation. The program goal is to advance agricultural literacy to all learners, especially K-12 students, and educators.

MAITC's mission is "to promote understanding and awareness of the importance of agriculture." We are pleased to offer the free AgMag series for kindergarten through 6th grade. Each issue is written and targeted to each specific grade level. The magazine is sent early in the school year for beginning readers. Teachers can use it when the reading level of their students matches the reading level of the magazine. We publish two issues each school year, in October and March.

## Why Ag in the Classroom?

Previously, 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 people have close contact with farming. They're not aware of their own—and the nation's—total dependence on agriculture. Think about it:

- Fewer than 2 out of 100 Americans work directly 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 one of the nation's largest industries It generates billions of dollars each year; one out of every five jobs depends on it in some way.

Agriculture is constantly changing. But one thing remains the same: Agriculture is a vital part of your day! Even as early as the primary grades, it's important for students to gain an understanding and appreciation for the ways agriculture touches their lives, each and every day. Food doesn't magically appear in the grocery store or on the kitchen table. It all starts with agriculture.

## 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. |
| 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 Theme: Agriculture: Agriculture is Everywhere!

- What is Agriculture?
- What Grows Where?
- Farming Across Minnesota
- Science in Agriculture
- Farming in a Glove
- State Symbols & Agriculture

## 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. 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.

**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.

# Agriculture: Helping You Every Day!

## Discussion Prompts:

- 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?
- 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.)

## Connecting to Agriculture

- Your students may need a little guidance in connecting the everyday items they use to a raw agriculture product. If you'd like to explore this concept more, draw a diagram on the board that connects an item to agriculture.
    - Ex: Cereal → main ingredient is grain → grown in a wheat field
    - Ex: Pencil → cut and assembled in a factory → made from wood → wood cut from forest

### Define:

- Because agriculture related words may be new to some of your students, make sure to go over their definitions:
    - Agriculture: Agriculture is making things that grow on farms, like plants and animals, into things that we use.

## Page 2: What is Agriculture?

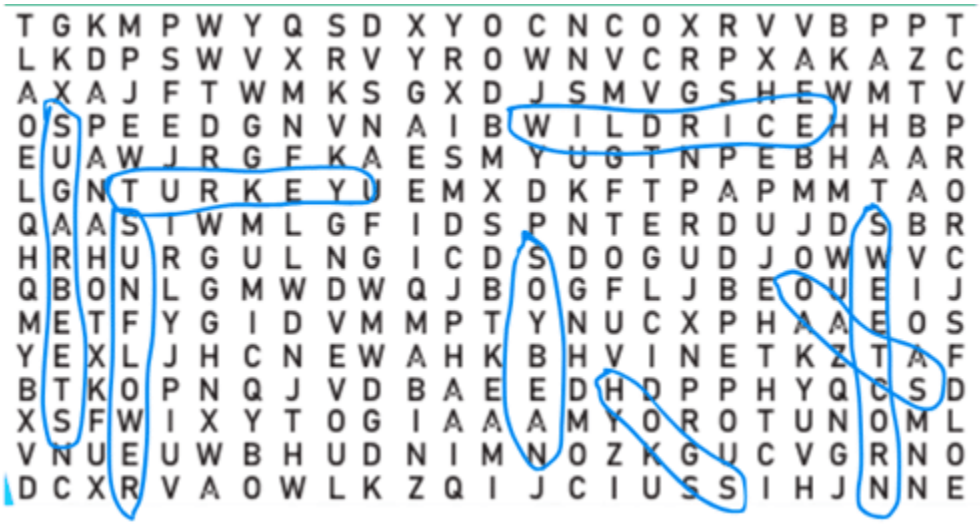
### Discussion Prompts:

- 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?
- 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

- 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.
- Minnesota is in the top 5 states for producing Sugar Beets, Wild Rice, Sunflower, Soybeans, Sweet Corn, Turkey, Oats, and Hogs. Have you ever seen any of these crops growing? What did they look like?

### Word Search Answer Key:



# Page 3: What Grows Where?

## Discussion Prompt:

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 extreme weather related events (like floods, early/late frosts, droughts etc.) eventually impact our food supplies and prices?

## Matching answers:

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

## Minnesota Rainfall answers:

- Which growing areas normally get the least rainfall each year? Northwest and Southwest
- Which area gets the most? . The Central and Northeast
- Why must farmers understand rainfall patterns when they choose which crops to plant? Specific crops need different amounts of moisture.
- What happens to farm crops when rainfall is way ABOVE normal?  Crops drown out or wash away. Yield is reduced.
- What happens to farm crops when rainfall is way BELOW normal?  Drought causes crops to wither or die. Yield is reduced.
- What And Where? Answers:
- 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

## Page 4-5: 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 and livestock farmers to plant breeders, there are connections to agriculture everywhere. What they all have in common is their love of growing plants, raising animals, and providing better ways to produce and protect the resources they are in charge of. Farmers also have a lot of knowledge about science, engineering, and technology in order to successfully grow their crops and raise their livestock. Today they are educated in how to sustainably farm to keep farmland healthy for years to come.

### Page 4: Red Lake Buffalo Ranch:

Pre-Reading:

1. Have you ever seen a buffalo? What do you know about buffalo? They are big, live in areas where there is lots of grass and land.
2. Did you know there used to be many more buffalo in North America than there currently are today. Why do you think there aren't as many buffalo as before? They've been over hunted by predators (including humans), disease, drought, competition from other animals like horses, etc.
3. What is the difference between a farm and a ranch? Ranches main focus is on raising livestock, while farms maintain crops and animals.

Post-Reading Questions:

1. Why is it important to the Red Lake Nation to eat locally grown food on their ranch?
2. Why is it important to use every part of the buffalo?

Additional Resources:

Watch this video to see the Red Lake Nation Buffalo Ranch and learn more about it:
This article from Red Lake Nation News has additional information: Red Lake Nation News

### Page 5: Pfarr Family Farm

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

| Input: | Output: |
|---|---|
| Time it takes to plant the fruit | Crops grown that season |

| | |
|---|---|
| Food for animals | Growth and health of the animals |
| Money to buy fertilizer | The health of the field/crops |

### Post-Reading Questions:

- How has the Pfarr family used technology to make his farm more efficient?
- Why would the Pfarr family want to lower their inputs?
- What does soil health have to do with farming? Why is it important?
- What benefits will Grayson's honeybees bring to the Pfarr farm?

### 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.

## Page 6: Science in Agriculture

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 changed because of plant breeders: The Daily Meal

### Do potatoes produce seeds?

In the article it was discussed how potato breeders like Laura 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 Laura 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?

### Teacher resource:

- Science Mag
- A more current article (from 2023)

### 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.

## 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.
8. 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)

## Types of seeds to use for Farming in a Glove:

- There are a variety of seeds you can use for this activity. One option is to use Soybeans, corn, oats, wheat and alfalfa seeds. If you'd like, you can purchase this kit that includes those seeds materials needed for a classroom of 30 students. You can also use this lesson plan if you'd like to do an entire unit on Farming in a Glove.
- Another option is to plant 5 varieties of corn seeds: popcorn, Indian corn, field corn, sweet corn, and flour corn. This kit includes the materials for 30 students to do this with the corn seeds.
- The "three sisters" crops (corn, beans, and squash) would also be great seeds that you could use. This lesson plan includes information on the legend of the "three sisters" and how you could use those seeds to do Farming in a Glove.

## 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: Farming in a Glove
- 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
- 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)

# 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”)

Take the Minnesota State Symbols game quiz on the Minnesota House of Representatives website.

## 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 Laura Shannon, 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.

## Name the Symbol Answers:

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