AgMag Winter 2019 Teacher's Guide

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-table connection is important in our consumer-driven society. That's what the student Minnesota AgMag Series is all about.

Integration Ideas
Social Studies

- Use the information from Minnesota Agriculture: Big Changes in Minnesota Agriculture (page 7) as the start to creating a historical timeline that illustrates the role of agriculture in Minnesota History. (There is additional history information from the Fall 2018 issue at MNAgMag.org.)
- Focus on a Minnesota crop such as corn, soybeans, or dairy, and have students research how **production** techniques have changed throughout history. Examples include: machinery and equipment, research and development of new genetics, herbicides and pesticides, soil and water improvement, and **conservation** techniques.

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: Stories from the points of view of plants or animals that depend on humans; predictions for agriculture in 2050 (or future years); letters to children in other countries with descriptions about agriculture here and questions about agriculture there.

Science and Math

- Identify the STEM involved in producing potato products in Minnesota (pages 4-5), plus having the students complete the Potato Math activity.
- Utilize and expand the graph and chart on page 8.

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, and they're also included in modified form in the student pages at MNAgMag.org. Words you may wish to pre-teach are:

AGRICULTURE SYSTEM: The steps required to get an agricultural product from the farm to the consumer. There are six steps that are usually involved:
Producing, **processing**, distributing, **marketing**, consuming, and **disposing**.
CONSUMERS: Someone who buys and uses goods. The process of buying and using those goods is called “consuming.”
DISPOSING: Putting unused or waste products into recycling, compost, or garbage processes.
DISTRIBUTING: Getting the processed products to places like grocery stores and farm markets.
HYBRID: A product that is created by combining two (or more) different elements.
INTERDEPENDENT: Two or more people or things that are dependent on each other.
MARKETING: Advertising agricultural products in places like TV and radio ads, magazines and newspapers, and the internet to help people know about them.
PROCESSING: Changing the **raw materials** into things we eat, wear, and use.
PRODUCERS: Someone who grows or develops goods to provide or sell to others. The process of growing or developing is called “producing.”
RAW MATERIALS: A basic material that has not yet been processed into something else.
NATURAL AND RENEWABLE RESOURCES: Resources that can be replaced or grown again if they are used.

Minnesota Academic Standards Connection

Subject	Standard Code	Benchmark
Social Studies	4.2.3.3.1	Describe the productivity of a resource and describe ways to increase it.
Social Studies	4.3.2.3.1	Locate and identify the physical and human characteristics of places in the U.S., Mexico, and Canada.
Social Studies	6.2.4.5.1	Describe the movement of goods and services, resources and money through markets in a market-based economy.
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	5.4.1.1.1	Describe how plants and animal structures and their functions provide an advantage for survival in a given natural system.
Math	5.2.1.1	Create and use rulers, tables, spreadsheets, and graphs to describe patterns of change and solve

		problems.
Math	6.1.3.4	Solve real-world and mathematical problems requiring arithmetic with decimals, fractions and mixed numbers.
English Language Arts	6.5.1.1	Cite textual evidence to support analysis of what the text says explicitly as well as inferences drawn from the text.

AgMag Cover (Social Studies)

1. What makes “Agriculture, the Land, and You” a good title for this page?
   - (Each of the products mentioned in the article and many shown in the photos started out with a connection to the land, the soil. They end up being used by people.)
2. What connections to agriculture do you see in these photos?
   - (Food [like potatoes and the many kinds in the shopping cart], sports equipment [the leather glove is made from animal hide, and the inside of the ball contains wool])
3. Why are **consumers** and **producers** **interdependent**?
   - (Because producers need people to buy their products, while consumers need producers to sell them the products they’ve grown and processed.)

Student Page 2 (Social Studies, Economics, Science)

1. How many things in your classroom came from agriculture?
2. 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? From pigs? Corn or soybeans?
3. Why do we say agriculture depends on **natural and renewable resources**?
   - (The agricultural products 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.)
4. What foods do NOT come from plants and animals?
   - (Mushrooms and yeast are fungi, not plants.)
5. Have you heard the phrase “amber waves of grain” before? What does it mean?
   - (It’s from the song “America the Beautiful”. It was written by Katharine Lee Bates, an English professor who was inspired to write it after taking a train across the U.S. Seeing extensive grain fields while riding through Kansas inspired the phrase, which was a tribute to America’s agricultural strength.)

Activity Answers

Matching and Naming

Top row, left to right:
6. Disposing
1. Producing
5. Consuming

Bottom row, left to right:
3. Distributing
4. Marketing
2. Processing

Discussion

Products with more steps use more energy, especially in processing. Example: Fresh potatoes are picked, cleaned, graded, packaged, and ready for consumers. Potato chips add slicing, baking or frying, seasoning, and inspection to the system.
Sun, air, water, and soil are the resources from which all agricultural products develop.

Student Page 3 (Social Studies, Economics, Science)
A Tale of Two Kingdoms

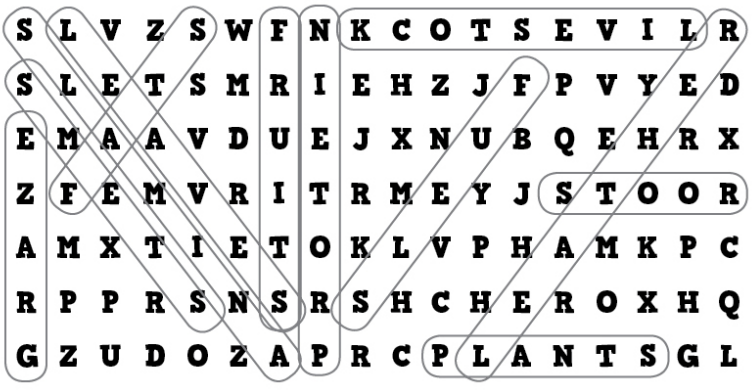
1. Why do some farmers choose to raise both plants and animals?
    - (Diversified crops and livestock reduce risk if one crop fails)
2. How does weather provide challenges to farmers of both plants and animals?
    - (Plants need rain and sunshine to grow, but too much of either is harmful; animals need to be protected against severe heat and cold)
3. After reading A Tale of Two Kingdoms, what are some of the ag products mentioned that you did not realize were ag products?
    - (Students may recognize vegetable and animal protein products, but may not have realized that wool, leather, animal fats in soaps, plastics, wood for paper and building materials, etc. are all ag products)

Word Find Answers:
Plants
Animals
Fuels
Roots
Stems
Leaves
Fruits
Livestock
Graze
Protein
Leather
Fats

Word Find

Find each of these words in the puzzle and circle them.

Plants	Fruits
Animals	Livestock
Fuels	Graze
Roots	Protein
Stems	Leather
Leaves	Fats



Student Pages 4 and 5 (Science, Social Studies, Economics)

Potatoes in the Agriculture System in Minnesota

1. Why do farmers grow different types of potatoes? (Different types of potatoes have different sugar content, some of which are better for processing than others. Potatoes are also the world's most popular vegetable and produce the most food per acre,)
2. Where are different places you can find potatoes or products made from potatoes? (Grocery stores, farm markets, food co-ops, convenience stores, school cafeterias, school concession stands, restaurants)
3. What ads have you seen for potato products? Do you think the ad was aimed at you or your parents? Why?
4. What kinds of potato products do you consume each week?
5. Like every type of food, potatoes have different types of nutrients. Have the students look at nutrition labels from various potato products (fresh potatoes, French fries, potato chips) and see how they differ.

Meet the Scientist

Discuss: Why is it important to study potatoes?
(Scientists develop new potato varieties that are less prone to disease and pest problems, so they can then provide higher yields and processing qualities. Farmers grow these potatoes and provide feedback to scientists on how the potatoes yield and grow on their farms. Farmers also identify new insects and weeds as well as environmental conditions that are affecting their potato production.
What other kinds of foods are likely to have scientists studying them?
(All of them!)

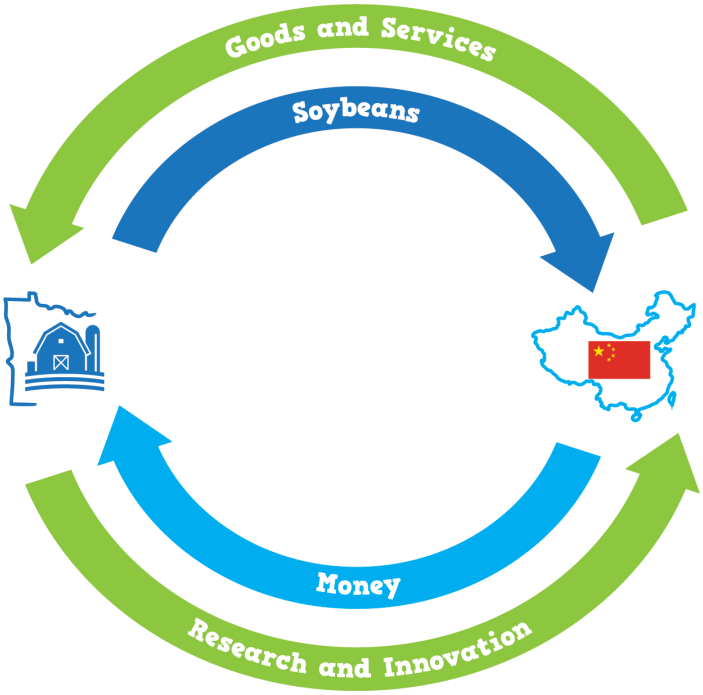
Potato Math Answers

1. **660 pieces** of potato per row
2. 22 rows
3. 660 x 22 = **14,520 pieces**
    a. 14,520 divided by 4 = **3,630 potatoes**

Student Page 6 (Social Studies, Science)
This lesson introduces two key economic concepts: market economy and circular flow.

A market economy (or market-based economy) is a free economy run by the laws of supply and demand and not regulated by the government, such as in the U.S. (vs. a planned economy controlled by the government, such as in China). That means that prices for goods and services are determined by supply (how many of those goods and services exist) and demand (how badly people want those particular goods and services). Prices are not controlled by the government or other groups.

The circular flow model describes how money flows in a circular route in a market economy. In the student AgMag magazine, an example is given of Minnesota farmers who grow soybeans, then sell them to China. China pays the Minnesota farmers, who use the money to pay employees and buy other products and services, some of which may come from China.



Discuss

What are some things that could disrupt a circular flow?
(Soybean crop failure, China doesn't pay, China doesn't have soybeans it needs to manufacture its products, can't sell those products here; current events, including tariffs and trade agreements)
What are some ways you see circular flow in your community?
(Parents earn income, buy groceries, grocery store pays employees, etc.)
Look at the picture of potato chips on page 4 of the student's magazine. Ask the students to walk through the circular flow for Old Dutch potato chips. (Minnesota farmers grow potatoes, earn money by selling them to Old Dutch; Old Dutch employees

unload trucks of those potatoes and process them into different products, employees earn wages; the potato chips are sold at stores, so the good produced move into the market and Old Dutch earns money to buy more potatoes and pay employees; when the company buys more potatoes, the farmers earn money.) How does this circular flow work with things like ice cream, flour, or cereal? (Farmers provide the primary ingredients for those foods, companies process and sell them, people buy them and eat them, so money flows back to the companies and the farmers)

Student Page 7 (History, Social Studies)

Big Changes in Minnesota Agriculture: 1900-1955
This article notes that **hybrid** seeds, **livestock** vaccines, and commercial fertilizers were big developments in this time period. Explain what these are before beginning the discussion below.

- **Hybrid seeds**: Seeds produced by cross-pollinated plants. This is usually done to merge positive characteristics of different plants, examples include increased crop yield and improved disease resistance.
- **Livestock vaccines**: Just as with humans, vaccines were developed to help reduce incidence of disease in livestock, making for healthier herds, and also larger herds, since they were not as likely to succumb to disease.
- **Commercial fertilizers**: Materials developed to add more nutrients to the soil or plant tissues, helping plants to get all the nutrients needed to grow a robust crop.

1. What does the population trend since 1950—more people in cities—mean for agriculture?
   - (More farmland is taken out of production and developed for urban uses. There are more consumers than producers. Production must keep increasing in order to feed everyone. Transportation and distribution of food from farm to table are even more important. Growing urban populations use more food, clothing, fuel, water, and other resources than rural areas. Conserving land, water, and energy resources and taking advantage of new technologies to increase food production will be even more important in the future. Developing, marketing, advertising, and selling new products becomes bigger business than ever.)
2. Now that you know what hybrid seeds are, why do you think hybrids are so important in crop production?
   - (A hybrid is developed from crossbreeding and cross-pollination of two different plants to make a new and improved plant. For example, plant breeders develop hybrids that can resist drought, grow in harsher weather, produce greater yields, and so on. Hybrids also give us a variety of new products. One example is the SweeTango apple, a hybrid of Zestar and Honeycrisp apples. The University of Minnesota is a national leader in developing hybrid apples.)
3. For more information about Minnesota's agriculture and farming history, visit http://www.mnagmag.org/archive.

Student Page 8 (Social Studies, Math)
Activity Answers
Talking Corn…and Soybeans

Use a United States map to check the students' placement of corn and soybean states, and have them check the layered U.S. map on the MNAgMag.org site, which provides more information about why corn and soybeans grow best in certain areas.

Discuss: What can you tell us about where corn and soybeans are grown? They are often grown in the same states. (This region is commonly called "the corn belt" because it includes most of the top producers of corn. And with corn comes soybeans. The region has favorable climate and terrain, rainfall, and fertile soils for producing both of these commodities. Abundant corn and soybeans make the region a leading producer of livestock, too because cattle, sheep, pigs, and poultry depend on corn and soybeans for feed. Corn and soybeans are both often planted in a crop rotation. Crop rotation occurs when farmers move crops around from year to year, rather than planting the same crop on the same piece of land year after year. When the crops are rotated, it helps prevent and manage disease and pests, and it helps maintain soil health.

2017 Top Soybean and Corn States

The magazine lists both the top soybean and top corn states in the U.S. from 2017, but several states made the top 10 list for both. North Dakota, and Wisconsin did not make both lists. That means that Illinois, Indiana, Iowa, Kansas, Minnesota, Missouri, Nebraska, Ohio, and South Dakota are all tops in soybeans and corn.

Strawberry-Picking Robots
Discuss: Why might robots have a harder time picking strawberries than humans? (Robots could more easily crush strawberries, might not be able to see if the berries are ripe, pick unripe berries and leave ripe berries behind) Here's a video you can show your students that illustrates how the robots work:
https://www.youtube.com/watch?time_continue=9&v=SmOkhVu6oUI

World Population Graph

Discuss: The world's population continues to grow. In fact, the world population today is growing faster than it has in the past 300 years. What does that mean for agriculture? (more demand for plants and animals; the amount of land to farm is finite, so new techniques and technologies will have to be develop to produce food for more people; other agriculture-related fields (scientists, inventors) will need to work with farmers to develop those techniques, technologies and strategies)

Quiz

[8 questions]
There are six steps in an agriculture system: Producing, processing, distributing, marketing, consuming, and-
Recycling
Selling
Disposing

What is the part of a potato that determines if it is a good source for processing or not?
Water
Sugar
Vitamin B

In a market economy, prices for goods and services are set by:
The government
Stores and service providers
Supply and demand

What does it mean when people like farmers and consumers are “interdependent”?
They need each other and contribute to each other’s wellbeing
Farmers need other farmers and consumers need other consumers
Each group gets along fine on their own

The Dust Bowl of the 1930s was caused by:
Drought and wind erosion of soil
Hot, humid weather
Floods and tornadoes

How many people are living in the world today?
7.3 billion
3.5 billion
12.1 billion

By 1950, more Minnesotans lived in cities than on farms for the first time ever.
False
True

Which two states lead the U.S. in both corn and soybean production?
South Dakota and North Dakota
Iowa and Illinois
Nebraska and Indiana