

Why Agriculture?

Teaching about agriculture in Iowa is an ideal way for students to learn what their state is all about and provide real-life connections to science, math, and social studies concepts. Agriculture is a topic that students can easily connect to because they encounter it often. Who doesn't enjoy talking about food? Nearly everything we eat, wear, use -- even the fuel that powers the cars and buses we ride in -- comes from plants and animals grown on farms. Agriculture provides perfect real-world connections to STEM and makes learning relevant to students.

Helping students understand the farm-to-table connection is important in our consumer-driven society. Teaching students to be agriculturally literate connects their learning to everyday life. That is what the *Iowa Ag Today* series is all about.

About Iowa Ag Today

Iowa Ag Today is a great supplement to your science, social studies, and language arts curriculum. Each issue is chock-full of discussion topics, new vocabulary, and other materials that you can easily integrate into lessons. Major highlights of each issue include:

Issue 1: Agriculture is Everywhere

- What is agriculture?
- Iowa agriculture crops, livestock, & products
- Agricultural careers

Issue 2: Food, Health & Lifestyle

- Nutrition
- Food safety

Issue 3: Agriculture and the Environment

- Natural resource management
- Agriculture in global ecosystems

Issue 4: Culture, Society, Economy & Geography

- Agriculture and the development of civilizations
- Iowa's agriculture innovators
- Geography, global trade, and economics

Issue 5: Science, Technology, Engineering & Math

- Science and technology to increase food production
- Safe, healthy, abundant food
- Sustainable systems for a growing population

Issue 6: Plants & Animals for Food, Fiber & Energy

- Domestication of plants and animals
- Renewable and non-renewable resources
- Plant and animal needs
- Biotechnology

Integration Ideas

- After reading the cover story, give students 2-3 minutes to write their thoughts about what they read. Working in small groups, have students pass their response to a classmate to respond to the text again or respond to what was written. After students have responded to each, have them discuss.
- Use the digital version of Iowa Ag Today to extend the learning opportunity to include Quizlet, deeper reading, view YouTube videos, math connections, engineering challenges, and more! (www.iowaagliteracy.org)
- Ask students to interview a farmer or someone from a local agriculture business to learn more about how they use science, technology, engineering, and math in their jobs.
- As a class, identify a problem and brainstorm ways technology could be used to help solve that problem. Problems could relate to farming efficiency, the environment, nutrition, or other agricultural issues. Working in small groups, design solutions, compare, and improve designs.



Please leave this resource a review by scanning the QR code or going to:

<https://form.jotform.com/220475624878163>

Alignment with Standards and Lexile

Subject	Code	Standard Lexile Measure = 800L
		Essential Concept or Skill/Standard
Science	4-PS3-4	Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.
Science	4-LS1-1	Construct an argument that plants and animals have internal and external structures that function to support survival, growth, behavior, and reproduction.
Science	4-ESS3-1	Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.
Science	3-5-ETS1-1	Define a simple design problem reflecting a need or a want that includes specified criteria for success and constraints on materials, time, or cost.
Science	3-5-ETS1-2	Generate and compare multiple possible solutions to a problem based on how well each is likely to meet the criteria and constraints of the problem.
Social Studies	SS.4.25	Analyze the impact of technological changes in Iowa, across time and place.
Social Studies	SS.4.26	Explain how Iowa's agriculture has changed over time.

Glossary

Some words in *Ag Today* may be unfamiliar to your students. These words often appear in bold type. Many are defined in the articles. Words you might wish to review with your students after reading the magazine are: (p. 1) **science, technology, engineering, math, sustainability (economic, social, environmental)**, (p. 2) **trait, hybrid, drought, disease tolerance, transgenic organism**, (p.3) **macronutrient, depleted, precision agriculture**, (p. 4-5) **head, feeder, threshing area, sieves, grain tank, auger, chaff, spreader**, (p. 6), **robotic milking machine, infra-red technology**, (p. 7) **decompose, byproducts**, (pg. 8) **monoslope, confinement building, solar energy, thermal energy, electrical energy**.

Discussion Prompters

Use the following page specific discussion prompts in large or small groups to foster article discussion. Help focus student's thoughts by providing the questions beforehand.

Cover (STEM Feeds the World)

1. How many people live in your community? (*Answers vary*)
How many people live in Iowa? (*3.19 million*) How many people live in the United States? (*333.29 million*)
2. What new technologies do you think could help with growing food with the same amount or less land?
(*Agriculture is much more efficient. There is more science, more technology. We produce more food with fewer inputs.*)
3. What does sustainability mean to you? How could we support sustainability in our town? (*Answers will vary.*)

Student Page 2 (One of a Kind)

1. How are the two plants pictured on the page different? (*The plant on the right is greener and has a stronger structure; the plant on the left is yellowing and showing signs of stress.*)
2. How do you think crossbreeding of plants (or hybrid plants) has impacted our food or fuel supply today? (What about the environment?) (*Answers may vary but could include- food: increase of yield with fewer inputs, fuel: higher oil/fat content increases fuel efficiency; fewer fertilizers and pesticides added*)
3. Why do you think a beef farmer would want their cattle to grow quickly and efficiently? (*When cattle are more efficient at transforming feed into body mass the farmer can use fewer inputs. The faster cattle get to market weight the quicker they can be sold, and more food can be produced.*)
4. In what ways could the loss of leaves impact a corn plant?
(*Leaves help plants transform solar energy into stored energy (food) and shade parts of the plant. Fewer leaves can lead to a plant making less food, susceptibility to extreme heat and disease, and reduction of fruit yield (fewer kernels on an ear of corn).*)

Student Page 3 (Math and Data Make Good Soil)

1. Soil agronomists use precision agriculture maps to make fertilizer prescriptions. The red area of the map has 12ppm of nitrogen. To grow corn, the soil should be 25ppm. How much nitrogen should the soil agronomist prescribe?
(*13ppm*)
2. How is using a by-product fertilizer sustainable? (*Answers will vary*)
3. Why would a farmer want to use coding technology in their equipment? (*Coding technology can help farmers be more efficient at applying pesticides and fertilizer which can increase sustainability*)

Student Pages 4 and 5 (Tools of the Trade Then and Now)

1. How do you think these tools impacted early agriculture workers? (*Answers will vary*)
2. In what ways do you think the invention of the combine impacted Iowa? (*Mechanical machines like the combine have improved efficiency and reduced the amount of labor needed to grow our food and fuel.*)
3. Have students create a model of how a combine works and label the simple machines they see. (*Answers should include screw, lever, wheel/axle, wedge, pulley, inclined plane*)

Student Page 6 (Tech'd Out Farms)

1. What types of technology have impacted your life?
(*Answers will vary*)
2. Why do you think technological advancements are important for agriculture? (*Answers will vary*)
3. How do you think having an app on a phone could help a turkey farmer? (*Answers will vary*)
4. Extend the learning by reading the Techie Turkey extension article found in the digital Iowa Ag Today issue 5 (www.iowaagliteracy.org/tools-resources/publications/iowa-ag-today-elementary-edition).

Student Page 7 (All in a Container & Nothing to Waste)

1. Data about waste is collected over many years. The data in the *Nothing to Waste* article is from 2018 and new information won't be published until mid-2020s. What are the pros and cons of data being published this way?
(*Answers will vary*)
2. What issues could be caused by plastics in ocean ecosystems? How might we (as a class) help to combat these problems? (*Answers will vary*)
3. What impact do you think plastic eating bacteria could have on the world? (*Answers will vary*)
4. How do farmers help reduce greenhouse gas emissions?
(*Some farmers will use by-products from food (e.g. apple mash), fuel (e.g. dried distillers' grain from ethanol production), or fiber (e.g. cotton seed) to feed to their livestock. This prevents the "waste" product from going to the landfill and decomposing.*)
5. Have students use their science and engineering skills to make banana bread using the recipe found in the digital copy of *Ag Today* on the IALF website (www.iowaagliteracy.org/tools-resources/publications/iowa-ag-today-elementary-edition).

Student Page 8 (Under One Roof)

1. How have advancements in building technology impacted food, fuel, or fiber production in Iowa? (*Protect livestock from predators, ease of care, maintain cleanliness, control temperatures, efficiency of growing food, fuel, and fiber*)
2. If there are 8 billion people on Earth, how many more people will we have to feed in 2050 when the population is 10 billion people? (*2 billion people*)
3. How do you think Erika Prewitt uses math in her career?
(*Answers will vary*)
4. Have students engineer a desktop greenhouse using the materials suggested. While their plant grows, students keep observations on how water and the plant impact erosion of soil in their greenhouse.

Show What You Know - Key

1. Nitrogen (N), phosphorus (P), and potassium (K)
2. 2 billion
3. Answers will vary but look for connections to environment, economics, and social impacts.
4. Farmers work together with scientists and engineers to continue improving mode agriculture to reduce impacts on the environment while providing for their community to feed, fuel, and clothe the world.
5. Answers will vary but look for connections to improvement of crops and livestock efficiency, application of fertilizer or pesticides, etc.
6. Early farmers harvested corn by hand. Later farmers used simple tools and horses.
7. With combines
8. Answers will vary but may include equipment, seed varieties, milking machines, etc.
9. Answers will vary but may include agronomist, veterinarian, data analyst, mathematician, programmer, plant breeder, etc.

Name: _____

Check one:

Pretest

Post-test

Show what you know!

Take this short quiz before you read *Ag Today*, then again after reading the magazine. See the improvement!

1.

What are the three main nutrients plants need?

2.

By the end of the year 2050, we may have as many as 10 billion people on Earth! Today we have 8 billion. How many additional people will we have in the year 2050? Show your thinking process.

3.

What is sustainability?

4.

How do people in agriculture impact sustainability?

5.

Name one way *science* and one way *math* impacts agriculture.

Science:

Math:

6.

How did early farmers in Iowa harvest corn?

7.

How do farmers harvest corn today?

8.

List two types of agriculture technology and their benefits.

9.

List two careers in agriculture other than farmer.

Name: _____



STEM Challenge:

Farming For Your Community

One hundred years ago, almost everyone had their own garden and grew their own food. Today, most of the population relies on farmers to grow their food. Imagine how farming looks in your community and what it could look like.

Your Challenge: Angel currently grows peas in Iowa. Angel is wanting to improve their farms sustainability. However, Angel isn't sure what a sustainable farm should look like. Angel also doesn't know what technology would be best for their farm to be sustainable. Angel has asked for your help to engineer a sustainable farm.

Brainstorming Focus Questions:

1. What problem are you trying to solve?
2. What information do you have that can help you solve the problem?
3. What information do you need to get to solve the problem?
4. Use the *Iowa Ag Today* and other resources to help you answer your questions in number 3.

Taking Action: Develop a proposal for Angel.

Angel's farm will need _____

to be sustainable. Angel will need agriculture technology such as _____, _____, and _____ because

Draw what you think Angel's farm could look like.

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