



# Agriculture research goals

## Middle School Food and Agricultural Literacy Curriculum

### Precepts

- F. Continuous Improvement
- F3. Use innovative problem solving strategies

### National Standards

- AS.03.02.01.a. Explain the importance of biosecurity to the animal industry.
- AS.06.01.02.a. Explain the implications of animal welfare and animal rights for animal agriculture.
- BS.01.03.01.a. Explore ethical, legal and social biotechnology issues.
- FPP.01.01.01.b. Evaluate changes and trends in the food products and processing industry.
- FPP.03.01.01.a. Discuss how research and industry developments lead to improvements in the food products and processing industry.
- NL-ENG.K-12.5 – Communication Strategies
- NL-ENG.K-12.6 – Applying Knowledge
- NS.5-8.1 – Science as Inquiry
- NS.5-8.3 – Life Science
- NS.5-8.5 – Science and Technology
- NS.5-8.6 – Science in Personal and Social Perspectives
- NT.K-12.2 – Social, Ethical, and Human Issues

### Student Learning Objectives

- As a result of this **unit** the students will...
- Discuss agricultural research.
- As a result of this **lesson** the students will ...
- Recognize three outcomes of agricultural research.

### Content Outline

- I. Define key terms within the lesson.
  - A. Outcome: The final product or conclusion.
  - B. Research: The investigation into a subject.
    - 1. Recognize outcomes of agriculture research that we benefit from
  - C. Goal: A desired result that we put effort towards

### Agriculture Science and Technology: Research

### Time

Instruction time for this lesson: 45 minutes

### Resources

Illinois Council on Food and Agriculture Research. (2009). C-FAR: The Food and Agricultural Research Arm for Illinois. Retrieved July 27, 2009 from C-FAR. Website: <http://www.ilcfar.org/research/outcomes09.pdf> — National FFA Organization. (2009). LifeKnowledge Online. Retrieved January 1, 2009, from <http://agedlearning.org>. — National FFA Organization. (2003). LifeKnowledge Precepts and Signs of Success. — The National Academies Press. (2003). Frontiers in Agricultural Research: Food, Health, Environment, and Communities. Board of Agriculture and Natural Resources.

### Tools, Equipment, and Supplies

Overhead projector/transparencies  
8.5 x 11 inch yellow or other colored paper  
Scissors  
Markers  
MS.AST.2.2.TM.A – one per teacher  
MS.AST.2.2.TM.B – one per teacher  
MS.AST.2.2.TM.C – one per teacher  
MS.AST.2.2.TM.D – one per teacher  
MS.AST.2.2.RUBRIC.A – one per student  
Calculators

### Key Terms

**Research**  
**Outcome**  
**Goal**

### II. Recognize outcomes of agricultural research.

- A. Nutritional outcomes and reductions in food-borne illness
- B. Enhanced biosecurity
- C. Animal welfare
- D. Environmental benefits
- E. More and varied products

### Interest Approach

Start by writing three lists of five numbers on the board. Ask students to add the first list in their head, then the second using paper and pencil, and the third using a calculator. Ask the students probing questions to understand why they know three different methods to do one task.



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Explain that even though they know how to do the most basic method of addition to the most technological way, each method is an outcome of research.

Connect this thought to agriculture by explaining that the same thing happens in agriculture. Use the examples of the tractor and animal medications showing they are the outcomes of agriculture research.

Thanks for coming to class on time today. We have some great things to learn! In the next 45 minutes we are going to explore how the **outcomes** of agriculture **research** have changed the world. We will find out just how we are affected. Let's get started!

In your head, please add the following numbers that are listed on the board and determine the **outcome**.

Who can give me the **outcome**?

Elicit responses.

Display the definition of outcome on **MS.AST.2.2.TM.D**:

Very good. Now with a pencil and scratch paper, add these numbers.

Place the second list of numbers on the board.

Who can tell me the **outcome**?

Elicit responses.

Very good. Lastly, please pull out your calculators and add the following list of numbers on the board. Who can give me the **outcome**?

Elicit responses.

Excellent! Which way was the easiest to add the numbers?

Students should say, "the calculator."

If we are able to do the math in our heads, why is it that the calculator was ever invented?

Elicit student responses.

Correct, it's easier. As humans, we strive to be more efficient in our work and our lives. Although we all learned to add, we also learned how to

become more efficient with calculators when doing math. The same thing happens in agriculture. Yes, we could push a plow through the field, but why not use a tractor? We could do surgery on animals without medications, but why not put them to sleep to ease their pain? The **outcome** of agriculture **research** has given us many great things.

Display **MS.AST.2.2.TM.D** and reveal the definition for research.

Agriculture **research** has made great impacts on the human race. Each day you benefit from an **outcome** of agriculture **research**. Let's see if we can figure out what benefits you, specifically, have gained from agriculture **research**.

## Summary of Content and Teaching Strategies

### Objective 1. Recognize outcomes of agriculture research.

Where do you think Americans want agriculture **research** to focus most of its time?

Elicit answers from students.

If you said food and fiber production, then you were correct! The major focus of agriculture **research** has been on enhancing agriculture productivity and efficiency. That basically means making more with less.

Scientific discoveries in plant and animal genetics, plant and animal nutrition, and livestock health have driven the great gains of **research** that each of us benefits from today.

What other factors have influenced the direction agriculture **research** has gone?

Elicit answers from students.

Correct, public values and perceptions! With an increase in the public's demand for environmentally safe and healthy food products, agriculture's **goals** have been altered. The demands made by Americans have made a great impact on the **outcomes** of agriculture **research**.



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In the next activity, students will retrieve the necessary materials to make graphic organizer booklets. Have one sheet of colored paper for every student and make sure that scissors and markers are easily accessible.

Today we are going to be creative and connect the **outcomes** of agriculture **research** with the public's demand by making a graphic organizer booklet. When I say STAND, retrieve a pair of scissors, one marker, and one piece of yellow paper and return to your seat. We will have 30 seconds. What questions do you have? STAND.

Now that we have returned to our seats, we will begin to make our graphic organizers.

Display **MS.AST.2.2.TM.A**; uncover steps one at a time as you explain them.

There are three steps we will follow when making our graphic organizer. Each step will be demonstrated, and when I say CREATE, mimic what I have done. Give me a "thumbs up" if you understand the directions. Excellent. Here we go! First, take your yellow paper and fold it in half the hamburger way leaving one-quarter-inch space before reaching the edge and fold.

Demonstrate the action.

CREATE!

Give 15 seconds to do this task.

Next, flip your paper over and again fold the back side leaving one-quarter-inch space before reaching the edge and fold.

Demonstrate the action.

CREATE!

Give 15 seconds to do this task.

With your scissors, cut five strips into the front page of your book. Cut three-quarters of the way to the papers edge so that the strips are still attached making each strip approximately the same width using the entire side of paper.

Demonstrate the action.

CREATE!

Give one minute to do this task, possibly longer if sharing scissors.

Great job. We just created an organizer that is shaped like a book. With your marker, title your book by writing "Agriculture Research Outcomes" on the binding edge.

Demonstrate the action.

CREATE.

Give 15 seconds for this task.

On the front side of each strip, please write down the following phrases/**goals**, one on each strip in descending order. CREATE!

Display **MS.AST.2.2.TM.B**.

Now that we have written down the five agricultural **research** phrases on the front of each strip, let's discuss what they represent. Each phrase is a **goal**.

Display **MS.AST.2.2.TM.D** and reveal the definition for goal.

Let's take down some notes on how each of these **goals** of agriculture **research** has resulted in an **outcome**.

Teachers may write down these notes on the whiteboard or use transparency **MS.AST.2.2.TM.C**. Ask students to brainstorm outcomes that relate to the goals. After students answer, provide them with the matching outcomes.

Let's start with **goal** number one. What **outcomes** can you think of that are related to this **goal**? Excellent. Here are some more ideas.

Show transparency or write down information on the whiteboard.

Please write down these agriculture **outcomes** on the reverse side of the flap as we discuss them.

Continue presentation and discussion of goals one through five providing them with corresponding outcomes. Students will write the corresponding outcomes on the reverse side of the flap and the real life example on the full inside page.

After completion, lead a discussion with the students showing how using innovative problem-solving strategies has changed the face of agriculture.



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The face of agriculture has changed due to American values and what the population demands. What do you think agriculturists did to successfully meet your needs?

Responses may include listening to people, problem solving, research, etc.

Great answers! Would it be accurate to say that agriculturists use problem-solving strategies?

See if you can pick out the problem from this statement. We will use the example of corn:

Ten years ago, we grew 30 percent less corn on an acre of land than we do now. What was the problem 10 years ago?

Students should say that we needed to find a way to grow more corn.

Very good. The problem was how to grow more corn but without any more land. Can anyone tell me how more corn is grown today on the same amount of land?

Elicit student responses.

Great! Agriculturists and scientists found a way to solve the problem by genetically modifying the corn so that it grew taller and produced more corn vertically than horizontally, therefore growing more corn on the same amount of space. Through **research** and innovative problem solving strategies, we solved our problem.

Can we use problem solving in our daily lives? Do you ever have to think outside of the box to find a solution? Who will give me a time when they had to solve a problem and used an out-of-the-box or innovative way to solve it?

Elicit responses from students.

Very good. Sometimes when we listen and put our heads together we can come up with solutions to small and big problems that make major impacts on each other and the world. This has been very true in agriculture. Without agriculture **research** and problem solving, we would not have the **outcomes** that we do today.

## Review/Summary

Utilize the *Dickens e-Moment®* to review the agriculture research goals and think of a story they could tell using the story line of man versus the unchanged agriculture world. The story should be at least seven sentences long and discuss each goal and a potential outcome. Students have 10 minutes to complete the task.

Let's review the **goals** of agriculture **research** that we learned earlier. Will someone please identify the five **goals**?

Students may use their booklets as a resource to recall the goals.

Very good. When I say DICKENS, using the **goals** and the **outcomes** that we have learned, you are going to write a story. The task includes writing a story line that incorporates each **goal** of agriculture **research** that we discussed today. The story line should be about man versus the unchanged agriculture world. It must be a minimum of seven sentences long and include each **goal** and a corresponding **outcome** somewhere in the story. Remember this is not a story writing contest, but rather a creative way to review our understanding of the material we covered today in class. We have 10 minutes to work on our stories. What questions do you have? DICKENS!

After the ten-minute time limit is up, students will turn in their stories as a graded assignment.

Time's up! Please pass forward your stories.

Today we talked about the **outcomes** of agriculture **research**. We worked on making connections between the **goals** of agriculture **research** and the **outcomes** of working towards those **goals**. Great job today as we made connections between **research** and its **outcomes** and how they are a part of our everyday lives.



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## Application

### **Extended Classroom Activity:**

Bring in the school nurse or health teacher to speak with students about the importance of food safety and water quality for students. Also bring in a local research scientist from your state extension service and have them speak on the research they are conducting at your local research station. Have them share the research accomplished in their research trials in your area.

### **FFA Activity:**

Encourage students to take part in one of the five categories of the agriscience fair. Students can partake in a hands-on project that demonstrates the application of scientific principles and emerging technologies in agricultural enterprises. Examples: students could conduct research projects, prepare a scientific report, or create a display on a project or judging.

### **SAE Activity:**

Students may start a research-based supervised agriculture experience project. Example: Students could do testing in food science and present their project in the agriscience fair.

## Evaluation

Use students' creative story from the *Dickens e-Moment*.

## Answers to Evaluation

MS.AST.2.2.RUBRIC.A



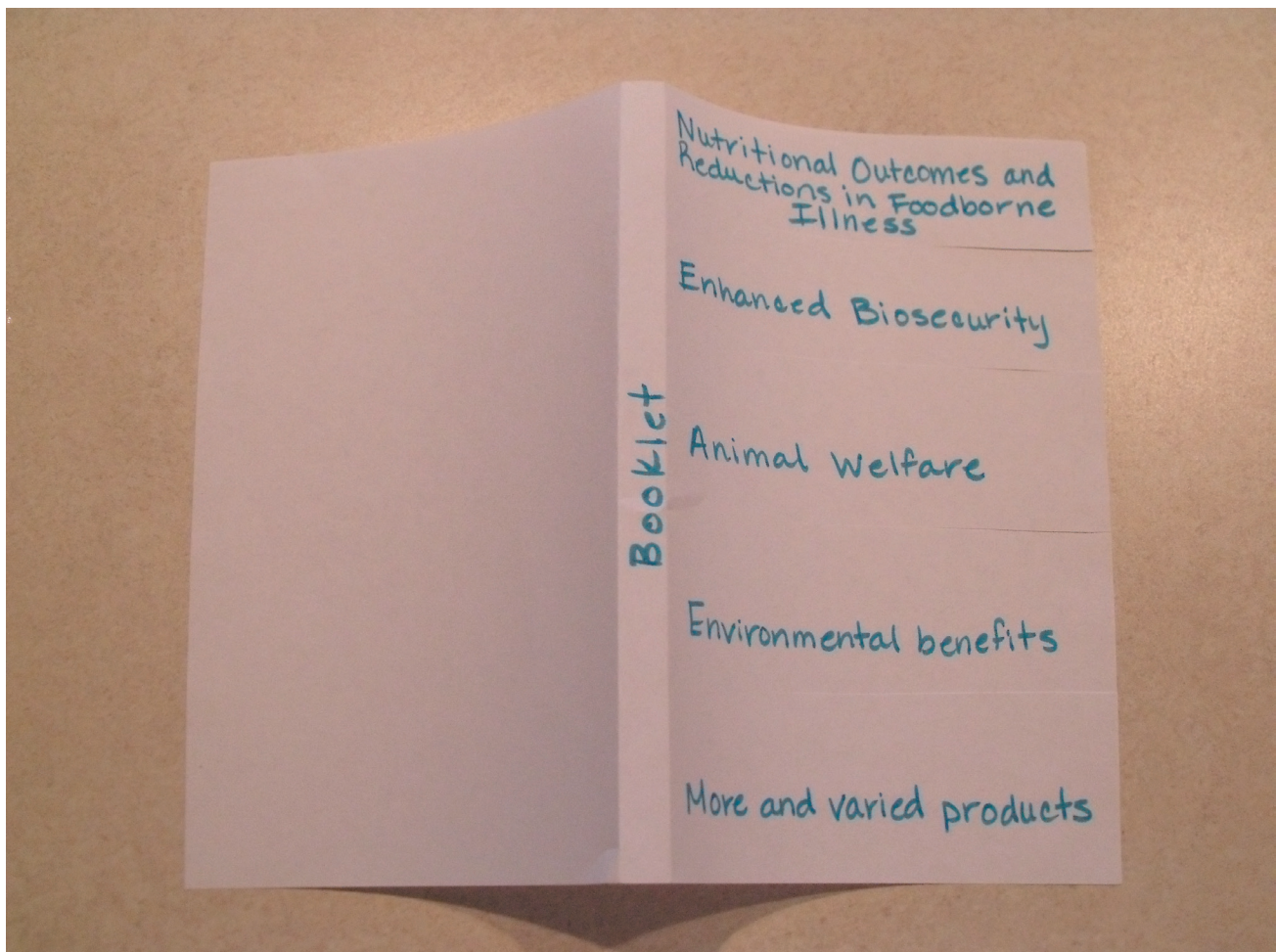
| Task to be Completed                                                                          | Point Value                                                               | Points Earned         |
|-----------------------------------------------------------------------------------------------|---------------------------------------------------------------------------|-----------------------|
| Proper creation of the graphic organizer. Neatness counts and writing needs to be legible     | 1 – Poor<br>2 – Fair<br>3 – Average<br>4 – Very Complete<br>5 – Excellent |                       |
| Acquisition of content knowledge. All necessary information included within graphic organizer | 1 – Poor<br>2 – Fair<br>3 – Average<br>4 – Very Complete<br>5 – Excellent |                       |
|                                                                                               |                                                                           | Total Points Earned = |



## Graphic Organizer Book — Instructional Steps

1. Fold an 8 x 11 piece of paper the hamburger way in half leaving one-quarter-inch space from the edge.
2. Flip the paper over and again fold the back side the hamburger way leaving one-quarter-inch space from the edge
3. With scissors, cut five strips into the front page of the book. Cut three-quarters of the way to the edge so that the strips are still attached making each strip approximately the same width using the entire side of paper.
4. Write one term out of the five on one of the five strips on the front page of the book.
5. Write definitions of the terms on the inside of the booklet keeping in line with the cut strip.

GRAPHIC OF WHAT THE FINISHED PRODUCT LOOKS LIKE:





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## **Agriculture Research Goal/Focus Areas**

- 1. Nutritional outcomes and reductions in food-borne illness**
- 2. Enhanced biosecurity**
- 3. Animal welfare**
- 4. Environmental benefits**
- 5. More and varied products**



# Agriculture Research Outcomes Notes Sheet

## 1. Nutritional outcomes and reductions in food-borne illness

- a. Mandatory use of the Nutrition Fact Card on all human food products
- b. Education of consumers on proper cooking and storage of food products
- c. Stringent guidelines for processing and handling of food products by producers and processors

**Real Life Example:** Increase promotion to consume soy-based foods supporting healthy diets and benefiting soybean growers, processors, and consumers.

## 2. Enhanced Biosecurity

- a. Increased attention to the risk of bioterrorism
- b. Improved microbiologic food safety
- c. Education of hazards of food allergens and toxicants
- d. Education of plant and animal diseases

**Real Life Example:** Food safety programs for elementary students sponsored by the 4-H youth program and the National FFA Organization along with increased Hazard Analysis Critical Control Point (HACCP) training programs, food safety curriculums, and public service announcements.

## 3. Animal Welfare

- a. Improved quality of feed for livestock
- b. New management practices to improve quality of life
- c. Improved prevention of animal disease and hazards

**Real Life Example:** Approximately 80% of the diets fed to the 260 million laying hens in the U.S. now contain the phytase enzyme that improves phosphorus utilization and reduces excretion of phosphorus in the manure.

## 4. Environmental Benefits

- a. Reduced pollution and conservation of benefits
- b. Advanced environmentally sound alternatives
- c. Integration of leading-edge environmental-science concepts and technologies

**Real Life Example:** Standards are being established on nutrient water quality standards and their relationship to agriculture practices.

## 5. More and varied products

- a. Increased availability of off-season products
- b. Creation of niche markets
- c. Increased use of value added markets

**Real Life Example:** Use of wool from sheep and goats for products such as filters to reduce livestock odor in confinement operations.



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## Key Terms

- A. Outcome:** The final product or conclusion
- B. Research:** The investigation into a subject.
- C. Goal:** A desired result that we put effort towards.