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Exploring Agricultural Science

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Course Blueprint

Instructor’s Guide

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1
Many of the Instructional Support Materials (ISMs) are developed to help students organize and use the unpacked content relative to the designated Revised Bloom’s Taxonomy (RBT) verb. These are designed to help students study and retain relevant information.

Ideally, each ISM would be duplicated and handed to students in class. Realistically, teachers may have to find alternative approaches for implementing the ISMs in the classroom.

Teachers may have to “show” what each ISM looks like and rely on students drawing each in either a journal or on paper that is accumulated in a notebook.

Consider these alternative approaches for using the Instructional Support Materials in the classroom:

- Draw the ISM on the board.
- Duplicate the ISM and hand out one per group and collect at the end of class for use in another. To add longevity, consider laminating or using sleeve protectors for each ISM.
- Laminate and have students use dry-erase marker pens if they need to write on the ISM. An alternative would be to place the ISM in a sleeve protector and have the students use dry-erase marker pens.
- Prepare a transparency of the ISM and show it on an overhead projector.
- Display the file in electronic form (PowerPoint or Word) through a digital projector.
- Display the file in electronic form on an interactive whiteboard.
- Display the file in electronic form via a document camera and digital projector.
- Deliver the file electronically via an internal network, Blackboard, Moodle, or secure website. This would provide added benefit to homebound and absent students needing to make up work.

Other helpful conservation hints…

- Always use both sides of the paper!!
- If a student needs to redo an assignment, whenever possible, have the student use a different color pen or pencil and work on the same paper.

We hope these ideas will help conserve paper and other valuable resources!
Adapted CTE Course Blueprint of Essential Standards

Essential standards are big, powerful ideas that are necessary and essential for students to know to be successful in a course. Essential standards identify the appropriate verb and cognitive process intended for the student to accomplish. Essential standards provide value throughout a student’s career in other courses and translate to the next level of education or world of work.

The essential standards use Revised Bloom’s Taxonomy (RBT) category verbs (remember, understand, apply, analyze, evaluate, create) that reflect the overall intended cognitive outcome for the course. Each essential standard and indicator reflects the intended level of learning through two dimensions; The Knowledge Dimension is represented with letters A-C and the Cognitive Process Dimension by numbers 1-6.

The Adapted CTE Course Blueprint includes units of instruction, essential standard(s) for each unit, and the specific indicators to direct learning. Also included are the relative weights of the units and essential standards within the course.

This document will help teachers plan for curriculum delivery for the year, prepare daily lesson plans, and construct valid formative, benchmark, and summative assessments. Assessment for this course is written at the level of the ESSENTIAL STANDARD and assesses the intended outcome of the sum of its indicators.

For additional information about this blueprint, contact the Department of Agricultural and Extension Education, North Carolina State University, Box 7654, Raleigh, NC 27695-7654.


Interpretation of Columns on the NCDPI Adapted CTE Course Blueprint

<table>
<thead>
<tr>
<th>No.</th>
<th>1</th>
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<tr>
<td>Heading</td>
<td>Essential Std #</td>
<td>Unit Titles, Essential Standards, and Indicators</td>
<td>Course Weight</td>
<td>RBT Designation</td>
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<tr>
<td>Column Information</td>
<td>Unique course identifier and essential standard number.</td>
<td>Statements of unit titles, essential standards per unit, and specific indicators per essential standard. If applicable, includes % for each indicator.</td>
<td>Shows the relative importance of each unit and essential standard. Course weight is used to help determine the percentage of total class time to be spent on each essential standard.</td>
<td>Classification of outcome behavior in essential standards and indicators in Dimensions according to the Revised Bloom’s Taxonomy.</td>
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Career and Technical Education conducts all activities and procedures without regard to race, color, creed, national origin, gender, or disability. The responsibility to adhere to safety standards and best professional practices is the duty of the practitioners, teachers, students, and/or others who apply the contents of this document. Career and Technical Student Organizations (CTSO) are an integral part of this curriculum. CTSOs are strategies used to teach course content, develop leadership, citizenship, responsibility, and proficiencies related to workplace needs.
Adapted CTE Course Blueprint of Essential Standards for
6829 Exploring Agricultural Science
(Recommended hours of instruction: 67 block schedule, 90 semester schedule)

<table>
<thead>
<tr>
<th>Essential Std #</th>
<th>Units, Essential Standards, and Indicators</th>
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<th>RBT Designation</th>
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<td>Total Course Weight</td>
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<td>Introduction to Agricultural Science</td>
<td>22%</td>
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<tr>
<td>1.00</td>
<td>Apply fundamentals of the agricultural science program.</td>
<td>10%</td>
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</tr>
<tr>
<td></td>
<td>1.01 Remember the basics of an agricultural science program. (6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>1.02 Implement foundational and life skills learned through agriculture in the school and community setting. (4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2.00</td>
<td>Understand the Importance of Agriculture to our social and economic well-being.</td>
<td>12%</td>
<td>B2</td>
</tr>
<tr>
<td></td>
<td>2.01 Interpret how agriculture supports life and how advances in the industry have helped society. (6%)</td>
<td></td>
<td></td>
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<tr>
<td></td>
<td>2.02 Understand skills and careers in the agricultural science industry. (6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>B</td>
<td>Agriculture and the Environment</td>
<td>40%</td>
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</tr>
<tr>
<td>3.00</td>
<td>Understand the relationship between natural resources and the production of food and fiber.</td>
<td>12%</td>
<td>B2</td>
</tr>
<tr>
<td></td>
<td>3.01 Explain the importance of natural resources in the agricultural industry. (8%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>3.02 Understand the role of alternative energy as it relates to the agricultural industry. (4%)</td>
<td></td>
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<tr>
<td>4.00</td>
<td>Understand how environmental stewardship within the agricultural industry relates to natural resource stewardship.</td>
<td>8%</td>
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<tr>
<td></td>
<td>4.01 Explain the environmental impact of plant and animal production. (5%)</td>
<td></td>
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</tr>
<tr>
<td></td>
<td>4.02 Exemplify strategies for effectively using resources in the agricultural industry. (3%)</td>
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<tr>
<td>5.00</td>
<td>Understand the fundamentals of the animal science industry.</td>
<td>12%</td>
<td>B2</td>
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<tr>
<td></td>
<td>5.01 Recognize terminology of common production systems used in the animal science industry. (6%)</td>
<td></td>
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<tr>
<td></td>
<td>5.02 Understand the importance of animal product uses and consumer product awareness. (3%)</td>
<td></td>
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<tr>
<td></td>
<td>5.03 Understand responsible animal welfare and care practices and the environmental impacts related to animal production. (3%)</td>
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<tr>
<td>6.00</td>
<td>Understand the fundamentals of the plant science industry.</td>
<td>8%</td>
<td>B2</td>
</tr>
<tr>
<td></td>
<td>6.01 Understand basic plant physiology. (4%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>6.02 Exemplify the uses of plants and plant products. (4%)</td>
<td></td>
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<tr>
<td>C</td>
<td>Modern Agricultural Practices for Safe Food and Fiber</td>
<td>38%</td>
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<tr>
<td>7.00</td>
<td>Understand the importance of food and agricultural product processes.</td>
<td>15%</td>
<td>B2</td>
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<tr>
<td></td>
<td>7.01 Understand agribusiness, government, and the consumer role in providing safe agricultural products for consumption. (5%)</td>
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<tr>
<td></td>
<td>7.02 Understand processes involved in converting agricultural products to food and fiber products. (5%)</td>
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<tr>
<td></td>
<td>7.03 Understand marketing and labeling principles that help consumers. (5%)</td>
<td></td>
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<tr>
<td>8.00</td>
<td>Understand the role of science and technology in the agricultural industry.</td>
<td>11%</td>
<td>B2</td>
</tr>
<tr>
<td></td>
<td>8.01 Understand the role of research in the agricultural industry. (5%)</td>
<td></td>
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<tr>
<td></td>
<td>8.02 Understand concepts and issues related to biotechnology and other emerging technologies in the agricultural industry. (6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Essential Std #</td>
<td>Units, Essential Standards, and Indicators</td>
<td>Course Weight</td>
<td>RBT Designation</td>
</tr>
<tr>
<td>----------------</td>
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</tr>
<tr>
<td>9.00</td>
<td>Understand the current issues impacting the agricultural industry.</td>
<td>12%</td>
<td>B2</td>
</tr>
<tr>
<td></td>
<td>9.01 Recognize issues impacting the agricultural industry. (6%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>9.02 Explain the economic impact of agriculture issues and the role advocacy. (3%)</td>
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<tr>
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<td>9.03 Understand animal welfare and animal rights in production and showing of animals. (3%)</td>
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<tr>
<td>Essential Std #</td>
<td>Units, Essential Standards, and Indicators (The Learner will be able to:)</td>
<td>Discipline per Blueprint Unit</td>
<td>Lessons per Indicator</td>
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<tr>
<td>A</td>
<td>Introduction to Agricultural Science</td>
<td>The Official FFA Student Handbook Advisor’s Guide and (SHAG) Middle School Food and Agricultural Literacy Curriculum</td>
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</tr>
<tr>
<td>1.00</td>
<td>Apply fundamentals of the agricultural science program.</td>
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</tr>
<tr>
<td>1.01 Remember the basics of an agricultural science program. (6%)</td>
<td>Unit 1 “FFA Basics” Unit 2 “FFA History” Unit 4 “FFA Programs”</td>
<td>SHAG Lessons 1.1 – 1.9; SHAG Lessons 2.1 – 2.3; SHAG Lessons 4.4 - 4.7</td>
<td>Lessons 1.1 – 1.2; Lesson 2.2; Lessons 5.1 – 5.3</td>
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<tr>
<td>1.02 Implement foundational and life skills learned through agriculture in the school and community setting. (4)%</td>
<td>Unit: Introduction to Agricultural Science Areas: Human Safety, Defining Agriculture, and Agricultural Perceptions Lesson 2.1; Lessons 4.1 – 4.2; Lesson 8.1</td>
<td>Lesson 7.1</td>
<td></td>
</tr>
<tr>
<td>2.00 Understand the Importance of Agriculture to our social and economic well-being.</td>
<td>Unit: Introduction to Agricultural Science Areas: Defining Agriculture, Agriculture Products, Overview</td>
<td>Lesson 2.1; Lesson 2.4; Lesson 8.5; Lesson 2.3 to be placed where teacher feels it works best</td>
<td>Lessons 1.1 - 1.2</td>
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<tr>
<td>2.02 Understand skills and careers in the agricultural science industry. (6%)</td>
<td>Unit: Agricultural Science and Technology Area: History of Ag Innovations</td>
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<td>Use with 8.5 above</td>
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<td>Unit: Introduction to Agricultural Science Areas: Overview</td>
<td></td>
<td>Lesson 8.7</td>
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<tr>
<td></td>
<td>Unit: Careers in Agricultural Science Area: Career Exploration</td>
<td></td>
<td>Lessons 1.1 – 1.11</td>
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<tr>
<td>Essential Std #</td>
<td>Units, Essential Standards, and Indicators (The Learner will be able to:)</td>
<td>Discipline per Blueprint Unit</td>
<td>Lessons per Indicator</td>
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<tr>
<td>B 3.00</td>
<td>Agriculture and the Environment, Understand the relationship between natural resources and the production of food and fiber.</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>3.01 Explain the importance of natural resources in the agricultural industry. (8%)</td>
<td>Unit: Introduction to Agricultural Science Areas: Overview</td>
<td>Lesson 8.4</td>
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<td>Unit: Natural Resources Areas: Renewable vs. Non-renewable, Air, Water, Soil, and Forestry</td>
<td>Lessons 1.1 – 1.2; Lesson 2.1; Lessons 3.1 – 3.4; Lessons 4.1 – 4.4; Lessons 5.1 – 5.4</td>
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<td>3.02 Understand the role of alternative energy as it relates to the agricultural industry. (4%)</td>
<td>Unit: Natural Resources Areas: Alternative Energy</td>
<td>Lessons 6.1 – 6.5</td>
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<td>4.00</td>
<td>Understand how environmental stewardship within the agricultural industry relates to natural resource stewardship.</td>
<td>Unit: Introduction to Agricultural Science Areas: Stewardship</td>
<td>Lesson 7.2</td>
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<td>4.01 Explain the environmental impact of plant and animal production. (5%)</td>
<td>Unit: Animal Science Areas: Environmental Sustainability</td>
<td>Lessons 6.1 – 6.3</td>
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<td>Unit: Plant Science Areas: Environmental Impact</td>
<td>Lessons 4.1 – 4.2</td>
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<td>4.02 Exemplify strategies for effectively using resources in the agricultural industry. (3%)</td>
<td>Unit: Natural Resources Areas: Natural Resource Stewardship</td>
<td>Lessons 7.1 – 7.5</td>
</tr>
<tr>
<td>5.00</td>
<td>Understand the fundamentals of the animal science industry.</td>
<td>Unit: Animal Science Areas: Terminology</td>
<td>Lessons 1.1 – 1.2</td>
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<tr>
<td></td>
<td>5.01 Recognize terminology of common production systems used in the animal science industry. (6%)</td>
<td>Unit: Animal Science Areas: Production Systems</td>
<td>Lessons 2.1 – 2.8</td>
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<td>Unit: Animal Science Areas: By-Products</td>
<td>Lessons 3.1 – 3.2</td>
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<td>5.02 Understand the importance of animal product uses and consumer product awareness. (3%)</td>
<td>Unit: Animal Science Areas: Consumer Awareness</td>
<td>Lessons 4.1 – 4.2</td>
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<td>5.03 Understand responsible animal welfare and care practices and the environmental impact related to animal production. (3%)</td>
<td>Unit: Animal Science Areas: Animal Welfare and Care</td>
<td>Lessons 5.1 – 5.4</td>
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<tr>
<td>Essential Std #</td>
<td>Units, Essential Standards, and Indicators (The Learner will be able to:)</td>
<td>Discipline per Blueprint Unit</td>
<td>Lessons per Indicator</td>
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<tr>
<td>6.00</td>
<td>Understand the fundamentals of the plant science industry.</td>
<td>Unit: Plant Science</td>
<td>Lessons 1 – 1.3</td>
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<tr>
<td></td>
<td>6.01 Understand basic plant physiology. (4%)</td>
<td>Areas: Plant Science and Anatomy</td>
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<td>6.02 Exemplify the uses of plants and plant products. (4%)</td>
<td>Unit: Plant Science</td>
<td>Lessons 2.1 – 2.2</td>
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<td>Areas: Consumer Awareness</td>
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<td>Unit: Plant Science</td>
<td>Lessons 3.1 – 3.2</td>
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<td>Areas: Fiber</td>
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<tr>
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<td>Modern Agricultural Practices for Safe Food and Fiber</td>
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<tr>
<td>7.00</td>
<td>Understand the importance of food and agricultural product processes.</td>
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<tr>
<td></td>
<td>7.01 Understand agribusiness, government, and the consumer role in providing safe agricultural products for consumption. (5%)</td>
<td>Unit: Food Science</td>
<td>Lessons 1.1 – 1.8</td>
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<td>Areas: Consumer Awareness – Field to Fork</td>
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<td>7.02 Understand processes involved in converting agricultural products to food and fiber products. (5%)</td>
<td>Unit: Introduction to Agricultural Science</td>
<td>Lessons 6.1 – 6.2</td>
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<td>Areas: Consumer Knowledge</td>
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<td>7.03 Understand marketing and labeling principles that help consumers. (5%)</td>
<td>Unit: Food Science</td>
<td>Lessons 2.1 – 2.8</td>
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<td>Areas: Processing Safety</td>
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<td>Unit: Food Science</td>
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<td>Areas: Food Nutrition and Labeling</td>
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<tr>
<td>8.00</td>
<td>Understand the role of science and technology in the agricultural industry.</td>
<td>Unit: Agricultural Science and Technology</td>
<td>Lessons 2.1 – 2.9</td>
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<tr>
<td></td>
<td>8.01 Understand the role of research in the agricultural industry. (5%)</td>
<td>Areas: Research</td>
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<tr>
<td></td>
<td>8.02 Understand concepts and issues related to biotechnology and other emerging technologies in the agricultural industry. (6%)</td>
<td>Unit: Agricultural Science and Technology</td>
<td>Lessons 3.1 – 3.2</td>
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<tr>
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<td>Areas: Biotechnology</td>
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<td>Unit: Agricultural Science and Technology</td>
<td>Lessons 4.1 – 4.3</td>
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<td>Areas: Emerging Technology</td>
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<td></td>
<td>Unit: Plant Science</td>
<td>Lessons 5.1 – 5.3</td>
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<td>Areas: Technology</td>
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<tr>
<td>9.00</td>
<td>Understand the current issues impacting the agricultural industry.</td>
<td>Unit: Introduction to Agricultural Science</td>
<td>Lesson 8.6</td>
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<tr>
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<td>9.01 Recognize issues impacting the agricultural industry. (6%)</td>
<td>Areas: Overview</td>
<td>Lessons 8.2 – 8.3</td>
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<td>Unit: Agricultural Issues</td>
<td>Lesson 8.6</td>
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<td>Areas: Evaluating Issues</td>
<td>Lessons 1.1 – 1.6</td>
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<td>9.02 Explain the economic impact of agriculture issues and the role advocacy has in the agriculture. (3%)</td>
<td>Unit: Agricultural Issues</td>
<td>Lessons 2.1 – 2.4</td>
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<td>Areas: Economic Impacts</td>
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<td>9.03 Understand animal welfare and animal rights in production and showing of animals. (3%)</td>
<td>Unit: Agricultural Issues</td>
<td>Lessons 4.1 – 2.6</td>
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<td>Areas: Agriculture Advocacy</td>
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<td>Areas: Animal Welfare vs. Rights</td>
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All materials found in the Suggested Activities section for each Objective, is located in the Google Drive for Exploring Agriscience on the Curriculum page at www.ncffa.org
Table

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<thead>
<tr>
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<th>EXPLORING AGRICULTURAL SCIENCE</th>
<th>INTRODUCTION TO AGRICULTURAL SCIENCE</th>
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<td>ESSENTIAL STANDARD:</td>
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</tr>
<tr>
<td>OBJECTIVE:</td>
<td>1.01</td>
<td>6%</td>
</tr>
</tbody>
</table>

Sources of Information:
National FFA Organization; The Official FFA Student Handbook
The Council, SAE for All Teacher Edition

Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Opportunities available within the FFA
A. What is FFA?
   1. Dynamic youth organization within agricultural education that prepares students for premier leadership, personal growth, and career success.
   2. Created in 1928 as the Future Farmers of America; however, the name was changed to the National FFA Organization in 1988 to reflect the growing diversity of agriculture.
   3. More than 500,000 student members are engaged in a wide range of agricultural education activities, leading to over 300 career opportunities in the agricultural science, food, fiber, and natural resources industry.
   4. Student success is the primary mission of FFA
   5. FFA is structured on three levels – local, state, and national

B. Opportunities
   1. Leadership
   2. Travel
   3. Earn money
   4. Be part of a team
   5. Service
   6. Succeed
   7. Have fun

II. Three-Circle Model of Agricultural Education
A. Classroom/Laboratory
   1. Learn about the vast world of agriculture
   2. Learn with hands-on activities

B. FFA
   1. Nation’s largest student organization
   2. Students with an agricultural pathway are eligible to join FFA

C. Supervised Agricultural Experience (SAE)
   1. Hands-on project that students create based on their interests

III. FFA Mission Statement
A. Premier Leadership
   1. Actions, not title, demonstrate leadership
   2. Action, relationships, vision, character, awareness and continuous improvement

B. Personal Growth
   1. Positive evolution of the whole person
   2. Physical growth, social growth, professional growth, emotional growth, and spiritual growth

C. Career Success
   1. Demonstrating qualities to succeed in a profession while contributing to society
   2. Communication, decision making, flexibility/adaptability and technical/functional skills in agriculture

D. FFA Motto
   1. Learning to Do, Doing the Learn, Earning to Live, Living to Serve

E. FFA Salute
   1. Pledge of Allegiance: “I pledge allegiance to the flag of the United States of America and to the Republic for which it stands, one nation under God, indivisible, with liberty and justice for all”

IV. FFA Emblem and Colors
   A. Parts of the Emblem
      1. Cross section of corn – represents unity
      2. Rising Sun – represents progress
      3. Plow – represents labor and tillage of the soil
      4. Eagle – represents freedom
      5. Owl – represents knowledge
      6. The words Agriculture Education and FFA – signifies the combination of learning and leadership necessary for progressive agriculture

   B. FFA Colors
      1. National Blue – for the blue field of our nation’s flag
      2. Corn Gold – for the golden fields of ripened corn

V. Levels of FFA Membership
   A. Three levels of membership
      1. Active
         a. A middle or high school student
         b. Enrolled in agriculture education classes/agriculture pathway
         c. Paid chapter dues
      2. Alumni
         a. A past member or one who has never been an active member
         b. Provides volunteer hours at the chapter, state, and national levels
      3. Honorary
         a. Parent or community member who has gone beyond the call of duty
         b. Membership is a form of recognition
         c. Does not possess voting rights or privileges available to active FFA members
VI. FFA Code of Ethics
A. Adopted by delegates at the 25th National FFA Convention and revised by delegates at the 1995 National FFA Convention
B. A pledge by FFA members to conduct themselves at all times to be a credit to their organization, chapter, school, community and family
C. Code of Ethics includes the following 11 items
   1. Develop my potential for premier leadership, personal growth and career success.
   2. Make a positive difference in the lives of others.
   4. Respect the rights of others and their property.
   5. Be courteous, honest and fair with others.
   6. Communicate in an appropriate, purposeful and positive manner.
   7. Demonstrate good sportsmanship by being modest in winning and generous in defeat.
   8. Make myself aware of FFA programs and activities and be an active participant.
   9. Conduct and value a supervised agricultural experience program.
  10. Strive to establish and enhance my skills through agricultural education in order to enter a successful career.
  11. Appreciate and promote diversity in our organization

VII. FFA Creed
A. Written by E. M. Tiffany and adopted by delegates at the 3rd national FFA Convention in 1930, Revisions made in 1965 and 1990
B. A creed is a statement of beliefs.
C. The FFA Creed is one of the longest standing parts of the organization with the basic values and believes still intact and remain a solid foundation for the organization’s principles
D. Learning the FFA Creed is a great way to understand the meaning and spirit of FFA and agriculture.

VIII. Official FFA Dress
A. Before the blue corduroy jacket was selected as the official FFA dress, the official FFA uniform was a dark blue shirt, blue or white trousers, blue cap and yellow tie.
B. Because the FFA jacket is the most recognizable symbol of the organization, there are several guidelines for the proper use of the jacket:
   1. The jacket is to be worn only by members.
   2. The jacket should be kept clean and neat.
   3. The back of the jacket should have only: the state association and the name of the local chapter, region, district or area. The front of the jacket should have only: a small official FFA emblem, the name of the individual, one office or honor and the year of that office or honor.
   4. The jacket should be worn on official occasions with the zipper fastened to the top. The collar should be turned down and the cuffs buttoned.
5. The jacket should be worn by members and officers on all official FFA occasions, as well as other occasions where the chapter or state association is represented. It may be worn to school and other appropriate places.
6. The jacket should only be worn to places that are appropriate for members to visit.
7. School letters and insignia of other organizations should not be attached to or worn on the jacket.
8. When the jacket becomes faded and worn, it should be discarded or the emblems and lettering removed.
9. The emblems and lettering should be removed if the jacket is given or sold to a non-member.
10. A member should act professionally when wearing the official FFA jacket.
11. Members should refrain from use of tobacco and alcohol when underage and at all times when representing FFA. In addition, members should exhibit their leadership qualities when they encounter substances including tobacco and alcohol and serve to discourage others from inappropriate behavior.
12. All chapter degree, officer and award medals should be worn beneath the name on the right side of the jacket, with the exception that a single State FFA Degree charm or American FFA Degree key should be worn above the name or attached to a standard key chain.
13. No more than three medals should be worn on the jacket. These should represent the highest degree earned, highest office held and the highest award earned.
14. Jackets should be discarded or have the emblems and lettering removed when they become faded and worn.
15. Members should act professionally when wearing the official FFA jacket.
16. Members should refrain from use of tobacco and alcohol when underage and at all times when representing FFA. FFA members should discourage others from inappropriate behavior when they encounter substances including tobacco and alcohol.

C. Official Dress for an FFA member includes:
   1. An official FFA jacket zipped to the top.
   2. Black slacks and black socks/nylons or black skirt and black nylons.
   3. White collared blouse or white collared shirt.
   4. Official FFA tie or official FFA scarf.
   5. Black dress shoes with closed heel and toe.

IX. FFA Degrees
A. Discovery Degree
B. Greenhand Degree
   1. Given out at the chapter level.
   2. Metal worn is made of Bronze.
   3. To receive a Greenhand FFA Degree, members must meet the following requirements:
a. Enroll in an agricultural education program and have satisfactory plans for a Supervised Agricultural Experience (SAE).
b. Learn and explain the FFA Creed, FFA Mission and Motto, and FFA salute.
c. Describe and explain the meaning of the FFA emblem and FFA colors.
d. Demonstrate an understanding of the FFA Code of Ethics and the proper use of the FFA jacket.
e. Demonstrate an understanding of the history of the organization, the chapter constitution and bylaws and the chapter Program of Activities.
f. Own or have access to the Official FFA Manual and the Official FFA Student Handbook.
g. Submit a written application for the Greenhand FFA Degree.

C. Chapter Degree
1. This degree of active membership is awarded at the chapter level.
2. The Chapter FFA Degree is given to an FFA chapter’s top members.
3. Degree indicated by silver metal.
4. To receive a Chapter FFA Degree, members must meet the following requirements:
   a. Received the Greenhand FFA Degree.
   b. Satisfactorily completed 180 hours (or the equivalent) of systematic school instruction in agricultural education at or above the ninth grade level.
   c. Have an approved SAE in operation.
   d. Enrolled in an agriculture course.
   e. Participated in the planning and implementation of at least three official FFA chapter activities.
   f. Earned and productively invested at least $150, or have worked at least 45 hours outside of scheduled class time, or a combination of the two, through their SAE.
   g. Have developed plans for continued growth and improvement of their SAE.
   h. Effectively lead a group discussion for 15 minutes.
   i. Demonstrated five parliamentary law procedures.
   j. Show progress toward achievement in FFA award programs.
   k. Have a satisfactory academic record.
   l. Submitted a written application for the Chapter FFA Degree.
   m. Complete a minimum of 10 hours of community service activities.

D. State FFA Degree
1. This degree of active membership is awarded at the state level.
2. To receive a State FFA Degree, members must meet the following requirements:
   a. Received a Chapter FFA Degree.
   b. Have been an active FFA member for at least two years (24 months) at the time of receiving the State FFA Degree.
c. Have completed at least 2 years (360 hours) of systematic school instruction in agricultural education at our above the ninth grade level, which includes an SAE.
d. Have earned and productively invested at least $1000 and worked at least 300 hours in excess of scheduled class time, in a supervised agricultural experience program. The combination of hours and earnings multiplied by a factor of 3.33 must be equal to or greater than the number 1,000.
e. Demonstrated leadership ability by performing 10 parliamentary law procedures, giving a six-minute speech on a topic relating to agriculture or FFA, and serving as an FFA officer, committee chairperson, or committee member.
f. Have a satisfactory academic record, certified by the agriculture teacher and the school principal or superintendent.
g. Participated in the planning and implementation of the chapter’s Program of Activities.
h. As of April 1, have completed ten activities above the chapter level in at least three of six different categories: leadership development events, career development events, conventions and meetings, project shows, student awards and leadership and service as described in policies adopted by the Board of Directors.
i. Complete at least 25 hours of community service in a minimum of two different activities. All community service hours are cumulative, i.e. the 10 community service hours used to obtain the chapter degree can be used toward the state degree.

E. American FFA Degree
1. This degree of active membership is awarded by the National FFA Organization and is the highest level of active membership which can be achieved within the FFA.
2. The American FFA Degree is a sign of great accomplishment among FFA members. Only a small percentage of FFA members ever earn the degree.
3. FFA members who qualify for the American FFA Degree:
   a. Have received a Greenhand FFA Degree, Chapter FFA Degree and State FFA Degree.
   b. Have been FFA members for at least three years.
   c. Have completed at least three years (540 hours) of high school agriculture classes, or 2 years of high school agriculture classes and one year of college agriculture classes (360 hours.)
   d. Have graduated from high school one year prior to the
   e. National FFA Convention at which their degree will be awarded.
   f. Have maintained detailed SAE records, which demonstrate outstanding planning, managerial and financial skills.
   g. Have earned and productively invested at least $7,500, or have earned and productively invested at least $1,500 and worked 2,250 hours beyond scheduled school hours through their SAEs.
Effective Jan. 1, 2015: A student after entering agricultural education must have: (a.) Earn at least $10,000 and productively invested $7,500 or (b.) Have earned and productively invested at least $2,000 and worked 2,250 unpaid hours in excess of scheduled class time; Any combination of hours, times a factor of 3.56 plus actual dollars earned and productively invested must be equal to or greater than the number 10,000. Hours used for the purpose of producing earnings reported as productively invested income shall not be duplicated as hours of credit to meet the minimum requirements for the degree.

Have a record of outstanding leadership skills. Have completed at least 50 hours of community service within at least three different community service activities. These hours are in addition to the paid or unpaid supervised agricultural experience hours.

Have a record of participating in community service activities. Have completed at least 50 hours of community service within at least three different community service activities. These hours are in addition to the paid or unpaid supervised agricultural experience hours.

Have maintained a “C” grade average or better.

X. FFA History: FFA & NFA
A. 1917: Smith-Hughes Vocational Education Act was passed by the US Congress providing federal funds to high schools that had vocational education classes.
B. 1920’s: Organizations like Future Farmers of Virginia began to form through specialized classes
C. 1926: National Congress of Vocational Agriculture Students gathered in Kansas City, MO for a national livestock judging show during the American Royal Livestock Show
D. 1927: New Farmers of Virginia, an organization for African-American agriculture students, held its first state rally
E. 1928: National organization of the Future Farmers of America was formed in Kansas City with 33 student delegates present, representing 18 states.
F. 1929: National blue and corn gold adopted as official FFA colors
G. 1935: New Farmers of America founded at Tuskegee Institute in Alabama
H. 1965: New Farmers of America merged with Future Farmers of America
I. 1965: FFA opened membership to girls
J. 1972: National FFA Alumni Association founded
K. 1976: Alaska became the last of the 50 states to obtain an FFA charter
L. 1988: Future Farmers of America changed its name to the National FFA Organization to reflect the growing diversity in the agriculture industry
M. 1988: FFA opened membership to seventh- and eighth-grade students

XI. Key people in FFA History
A. Charles Homer Lane
1. Worked to establish national judging contests for students of vocational agriculture
2. Helped draft the constitution for the Future Farmers of America
3. Co-wrote the first Official FFA Manual
4. Wrote the FFA motto
5. Was elected the first national FFA advisor

B. Henry C. Groseclose
1. Started the Agricultural Boys’ Club in 1922 in Buckingham, VA
2. Helped start the Future Farmers of Virginia in 1926
3. Helped write the constitution and by-laws for the Future Farmers of America
4. First National FFA Executive Secretary and Treasurer

C. Harry Oscar Sampson
1. One of the first high school agriculture educators, teaching Waterford, PA
2. Organized the Young Farmers Organization for New Jersey in 1923
3. Served as the New Jersey state Supervisor and teacher trainer for agriculture education

D. Harvey Owen Sargent
1. Founding father for both Future Farmers of America and New Farmers of America
2. Worked to improve and increase the number of agriculture programs available for American-American students and their teachers

E. G.W. Owens
1. Teacher trainer at Virginia State College in Petersburg, VA
2. Helping found the New Farmers of America

F. J.R. Thomas
1. Taught at Virginia State College
2. Served as National NFA advisor and the NFA executive secretary

G. David Simmons - First National FFA NFA President

H. Leslie Applegate - First national FFA president, from New Jersey

I. E.M. Tiffany – author of the FFA Creed

J. Fred McClure – First African American to hold a national FFA office, 1974

K. Julie Smiley – elected first female to hold a national FFA office, 1976

L. Jan Eberly – elected first female President, 1982

XII. Supervised Agriculture Experience (SAE)
A. Career exploration and planning system for all students
B. Student-led, teacher-supervised path to college and career readiness
C. Tool for measuring student progress toward college and career readiness
D. Method for authentically enhancing the high school experience
E. Small business incubator for young entrepreneurs
F. Path to connect students to TEM careers and mentors
G. Critical component of a comprehensive Career and Technical Education program

XIII. Types of Supervised Agriculture Experiences
A. Foundational - conducted by all students in the agricultural education program including students that are on a four-year sequence and those who enroll for a semester
1. Career Exploration and Planning  
   a. Students research and explore career opportunities  
   b. Complete interest inventories and identify a career goal  
   c. Describe career opportunities and the path to achieving those opportunities  
   d. Create a Career Plan  
2. Employability Skills for College and Career Readiness  
   a. Develop the skills needed to succeed in both college and career  
      i. Skills – responsibility, communication, innovation, critical thinking and collaboration  
   a. Craft a personal financial management plan  
   b. Understand how personal financial practices like budgeting, saving and appropriate use of credit lead to financial independence  
4. Workplace Safety  
   a. Examine and summarize the importance of health, safety, and environmental management systems in the workplace  
5. Agricultural Literacy – may be transitioned into Immersion SAEs  
   a. Base understanding of the width and breadth of the agricultural industry  
   b. Research and analyze how issues, trends, technologies and public policies impact the workplace  
   c. Evaluate the nature and role of agriculture in society and the economy  
   d. Components should lead to the selection and implementation of one or more of the Immersion SAE categories  

B. Immersion  
1. Even though Immersion SAEs are an extension of the Agricultural Literacy component of the Foundational SAE, they will contribute to a student’s growth in all of the Foundational components  
2. Designed to help students transition from career exploration to career preparation  
3. Take students into authentic work environments and settings  
4. May offer the opportunity for students to apply personal financial management and planning skills acquired through the Foundational SAE  
5. To foster and implement a culture of safety  
6. Students move beyond agricultural literacy to develop knowledge, skills and expertise within a specific career pathway  
7. Five types of Immersion SAEs  
   a. Placement/Internship: student is in an employment setting (either paid or volunteer)  
   b. Ownership/Entrepreneurship: Operate an individual business which provides goods and/or services to the marketplace  
   c. Research
i. Experimental – the application to the scientific method to control certain variables while changing others to observe the outcome

ii. Analytical – conducts analysis of data, facts and other information to determine the answer to a posed question of how or why somethings occurs

iii. Invention – applies the engineering design process to create a new product or service

d. School-Based Enterprise – an entrepreneurship operation that is based at the school and involves a group of students working cooperatively

e. Service Learning – conducted by one or more students in which they plan, conduct and evaluate a project designed to provide a service to the school, public entities, or the community

XIV. AFNR Career Pathways
A. Agribusiness Systems
B. Animal Systems
C. Biotechnology Systems
D. Environmental Service Systems
E. Food Products and Processing Systems
F. natural Resources Systems
G. Plant Systems
H. Power, Structural and Technical Systems

XV. Proficiency and Star Awards

A. Proficiency Awards

1. FFA awards those who have become proficient with in areas of their SAE at the local, state and national levels

2. Agricultural Proficiency Awards honor FFA members who, through their SAEs, have developed specialized skills that they can apply toward their future careers

3. Student can compete for awards in multiple areas covering everything from Agricultural Communication to Wildlife Management

4. Most award areas have two categories: placement and entrepreneurship

5. placement proficiency Awards are given to those who SAEs are related to employment, apprenticeships, or internships at an agribusiness or agriculture-related organization

6. Entrepreneurship Proficiency Awards are given to those who SAEs are related to ownership of an agribusiness or agriculture-related organization

7. Participates in the National Agricultural Proficiency Awards program will receive a rating or National Finalist, Gold, Silver, Bronze, Participant or Disqualified

8. Four “National Finalists” are selected for each award area and will go on to compete for a national proficiency award. National Agriculture Proficiency Award winners are announced onstage during the National FFA Convention.

B. American Star Awards
1. Represent the best of the best among thousands of American FFA Degree recipients
2. Finalists for the award have mastered skills in production, finance, management and/or research
3. Each State FFA Association recommends four American Star Award candidates – one for each of the four award areas
4. The national FFA Organization selects four finalist per award area (16 in all)
   a. American Star Farmer
   b. American Star in Agribusiness
   c. American Star in Agricultural Placement
   d. American Star in Agriscience

XVI. Safety Policies and Procedures for Classroom, laboratory, and virtual environment
A. Safety – decrease the risk of potential harm to yourself or others
   1. Taking safety precautions regularly may result in good safety habits
B. Different types of learning environments
   1. Classroom
   2. Agricultural Shop
   3. Greenhouse
   4. Small Animal Laboratory
   5. Biotechnology/Science Laboratory
   6. Farm/Livestock Laboratory
   7. Computer Laboratory
   8. Outdoor Classroom
C. Safety policies and procedures
   1. Different policies and procedures are required for different situations and locations
   2. Policies and procedures include wearing the appropriate clothing, using equipment properly, and adhering to the specific rules of each learning environment
D. Personal protective equipment(PPE) : items worn to protect and individual from potential harm or hazards in a working environment
   1. Examples of PPE
      a. Safety glasses
      b. Gloves
      c. Closed-toed shoes
      d. Hair ties
      e. Ear plugs
   2. Proper use of PPE
      a. Identify hazards
      b. Select PPE that will offer protection from hazards
E. Online Engagement practices
   1. Use of the internet
      a. Research (education and personal/special interest)
      b. Playing Games
      c. Entertainment (downloading/streaming music, watching videos)
d. Shopping
e. Communication
   i. E-mail
   ii. Chatting
   iii. Blogging
   iv. Social networking

2. Social Networking – connecting with people who share similar interest (personal or professional)
   a. Place of origin
   b. Attending the same school
   c. Sports
   d. Types of music
   e. Hobbies
   f. Religion
   g. Politics

3. Social networking website: an online community of Internet users who share similar interests
   a. MySpace
   b. Facebook
   c. Classmates
   d. Instagram
   e. SnapChat

4. Dangers associated with social networking
   a. Stalking
   b. Bullying
   c. Legal issues
   d. Damaged reputation
      i. Embarrassment at school
      ii. May affect future opportunities (college, work, etc.)

5. Internet safety risks other than social networking
   a. Computer viruses
   b. Uploading videos
   c. Illegal downloading of music
   d. Personal information/Fraud
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<td>Apply fundamentals of the agricultural science program</td>
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<td>Remember the basics of agricultural science program</td>
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Sources of Information:
- Middle School Food and Agricultural Literacy Curriculum – National FFA
- FFA New Horizons Teaching Guide, ffa.org
- National FFA Organization; The Official FFA Student Handbook, Advisors Guide
- The Council, SAE for All Student & Teacher Edition
- Laura Parker, Bandy’s High School

**Suggested Activities 1.01**

<table>
<thead>
<tr>
<th>Activity Number</th>
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| 1.01.01 | What is FFA  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.02 | **What is the three-circle model?**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.03 | **FFA Mission, Motto, and Salute**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.04 | **Emblem and Colors**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.05 | **Levels of Membership: Active, Collegiate, Alumni and Honorary**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.06 | **FFA Code of Ethics**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.07 | **What is the FFA Creed, and what does it mean?**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.08 | **Official Dress: Why, When, How and How to tie a tie**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.09 | **FFA Degrees**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.10 | **The Beginning: FFA and NFA**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.11 | **Leaders**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.12 | **FFA Timeline**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.13 | **What is a Supervised Agriculture (SAE) Program?**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.13 | **Types of Supervised Agriculture Experience (SAE) Programs**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.14 | **Supervised Agricultural Experiences (SAE) Ideas**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.15 | **Proficiency and Star Awards**  
National FFA Organization; The Official FFA Student Handbook, Advisors Guide |
| 1.01.16 | **Safety First**  
Middle School Food and Agricultural Literacy Curriculum |
| 1.01.17 | **Safe Time Online**  
Middle School Food and Agricultural Literacy Curriculum |
| 1.01.18 | **Elements of the Emblem**  
Laura Parker, Bandy’s High School |
| 1.01.19 | **FFA Doodle Notes**  
Laura Parker, Bandy’s High School |
| 1.01.20 | **3 Prong Approach**  
Laura Parker, Bandy’s High School |
| 1.01.21 | **FFA History Interactive Timeline**  
Laura Parker, Bandy’s High School |
| 1.01.22 | **Fifty Years of FFA**  
FFA New Horizons Teaching Guide, ffa.org |
| 1.01.23 | **Women in FFA**  
FFA New Horizons Teaching Guide, ffa.org |
| 1.02.24 | **SAE for ALL, Student Guide & Teacher Guide**  
The Council |
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Sources of Information: 
Middle School Food and Agricultural Literacy Curriculum – National FFA

Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Communication  
A. Group Communication – a message sent by a group member to one or more receivers with the intent to change other members’ behaviors  
   1. Effective Communication involves:  
      a. Sending the Message  
      b. Interpreting the Message  
      c. Receiving the message  
   2. Meeting Survival Guide  
      a. Be an active listener  
      b. Make sure your verbal and nonverbal messages are the same  
      c. Use “I” statements  
      d. Be engaged in the meeting  
      e. Seek first to understand and then be understood  
      f. Respect what others have to say and their opinions  

II. Methods for Decision-Making  
A. Authority: the person in a position of power makes the decision alone  
   1. Can be useful for quick administrative decisions  
   2. Leads to little commitment and group interaction. Decision may be a poor one.  
B. Expert member: a member with expert knowledge makes the decision for the group  
   1. Good when one person’s expertise far exceeds the groups knowledge  
   2. It is difficult to choose the expert and it can lead to low commitment along with resentment and jealousy  
C. Majority Vote: the decision of the majority prevails  
   1. Can be useful when there is little time and the group must decide  
   2. Leaves an alienated minority and can damage group effectiveness  
D. Committees: a small group of members is chosen to make the decision for the group
1. Good option when everyone cannot meet. Useful for simple routine decisions.
2. Does not utilize the resources of all group members and can lead to controversy.

E. Consensus: everyone discusses and compromises until a decision is agreed on by each member of the group
   1. Produces an innovative, creative, and high-quality decision where everyone is committed.
   2. Takes a great deal of time, requires effective team members, and is not the ideal choice for high pressure/emergency decisions.

III. Written and Oral communication
A. Communication
   1. An act or instance of transmitting
   2. Information communicated – a verbal or written message
   3. A process by which information is exchanged between individuals through a common system of symbols, signs, or behavior
   4. Three phases:
      a. Deliver – to give the verbal or nonverbal information to someone else
      b. Interpret – decoding and understanding the information that is given
      c. Receive – to get the verbal or nonverbal information from someone else

B. Effective Oral Communication
   1. Clear and concise
   2. Does not use slang
   3. Presented clearly
   4. Match nonverbal cues with what you’re saying
   5. Thinks about the audience
   6. Has been practiced

C. Effective Written Communication
   1. Clear and concise
   2. Keep sentences short and simple
   3. Should sound right when read aloud
   4. Is proofread more than once
   5. Uses proper grammar
   6. Is appropriate for the given audience

IV. Agriculture Leadership Opportunities
A. Agricultural Leadership
   1. Agricultural: relating to the food, fiber, and natural resource systems
   2. Leadership: Influence; an act or instance of leading, guidance, direction
   3. Agricultural leadership: the act of influencing those involved with food, fiber, and natural resources systems

B. Agricultural Leadership Opportunities
   1. Chapter FFA officer
   2. Creed Speaking Competition
3. Being on a committee
4. Teaching children about agriculture
5. Teaching adults about agriculture
6. Giving a speech on agriculture
7. Being a state of National FFA Officer
8. helping with a trash pickup day
9. Helping others with their FFA projects
10. Parliamentary Procedure contest
11. Extemporaneous speaking
12. Mentoring young students – PALS
13. Helping with National FFA Week
14. Creating a booth at the local fair
15. Career Development Events
16. Researching an agricultural issue
17. Completing an agriscience project
18. Starting a recycling team
19. Doing a short radio announcement
20. Writing a letter to your local congressman or woman

V. Importance of Personal Growth
A. We should all be lifelong learners
B. If you do not have a plan for growth, you tend to stay where you are
C. If you are ripe, you will rot: Concept of we are never “ready” or “done growing”
D. We must think about growth F.I.R.S.T.
E. Creating a personal growth plan using the F.I.R.S.T System
   1. Focus on where you can grow
      a. Decide what is important to you, and where you want to focus first
   2. Identify something you can do every day to grow
      a. Be specific
      b. Write the items down and keep track of them
   3. Reflect on what happens
      a. We learn from our mistakes
      b. Take time to evaluate what you do and the effect it has
   4. Seek feedback
      a. All of us need somebody who will give us some feedback
      b. It could be someone different for different areas
   5. Transfer what you learned into your next steps
      a. Once you have grown in one area, take what you have learned and set new goals
      b. It is a cycle

VI. Stewardship & Accountability
A. Stewardship: the careful and responsible management of something entrusted to one’s care
   1. Examples of stewardship
      a. Taking Care of a pet
      b. Babysitting
      c. Doing the laundry (washing/drying/folding clothes)
B. Accountability

1. Accountability: an obligation or willingness to accept responsibility or to account for one’s actions
   a. Examples of personal accountability
      i. School work and homework
      ii. Behavior
      iii. Being honest
   b. Examples of social accountability
      i. Throwing away trash
      ii. Recycling
      iii. Transportation choices

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<td>Implement foundational and life skills learned through agriculture in the school and community setting</td>
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Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA
National Agriculture in the Classroom; agclassroom.org
FFA New Horizons; wwwffa.org

Suggested Activities 1.02

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<td>Five Ways to Make a Decision Middle School Food and Agricultural Literacy Curriculum</td>
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<td>1.02.03</td>
<td>Getting the Message Across Middle School Food and Agricultural Literacy Curriculum</td>
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<td>1.02.04</td>
<td>The Final Four – Agricultural Leadership Opportunities Middle School Food and Agricultural Literacy Curriculum</td>
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<td>1.02.05</td>
<td>If You’re Ripe, You’ll Rot – Personal Growth Plans Middle School Food and Agricultural Literacy Curriculum</td>
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<td>1.02.06</td>
<td>Stewardship and Accountability Middle School Food and Agricultural Literacy Curriculum</td>
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<td>1.02.07</td>
<td>One Thing Leads to Another FFA New Horizons</td>
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<td>1.02.08</td>
<td>Read to Feed FFA New Horizons</td>
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Sources of Information:  
Middle School Food and Agricultural Literacy Curriculum – National FFA

**Note to teacher:** Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Scope of agriculture’s impact on daily life  
A. Agriculture: the production of many diverse types of food and fiber, utilizing a variety of methods based on geography, climate, tradition, and availability of resources.  
   1. Leading industry around the world, and looks different around the world  
   2. Agriculture in the US looks different than agriculture in China, just as it is different in California vs. Kansas.  
   3. Regardless of location or culture, the goal is the same, to feed and clothe all of the people of the world.  
B. Food: the diet of people around the world, both direct items like fruits and vegetables, to livestock feed which in turn provides meat for people.  
   1. Food is similar and different based on region, for example the world’s main crops are universal (wheat, oats, rice, and soybeans) but they are complimented by a variety of local foods.  
   2. Some countries, like the United States, produce and abundance of food, and others import much of the food they need.  
C. Fiber: the plant and animal material used to make fabric and clothing.  
   1. The methods and types have varied through history and culture.  
   2. Today cotton leads in plant based fiber production, but other plant items are gaining popularity such as soy and hemp.  
   3. Animal fibers include wool (sheep) and other lesson common animals such as camels and alpacas.  
   4. Cotton did not explode in popularity until the invention of the cotton gin, which made its processing affordable and efficient.  
D. Natural Resources: something, such as a forest, a mineral deposit, or fresh water that is found in nature and is necessary or useful to humans.  
   1. Example: Lumber (from trees) used to build a home or paper used for writing. Generally, these items exist in limited supply, and should be conserved.
2. Renewable refers to using the natural resource in a sustainable way (only taking what can naturally be replaced.
   a. Example: trees/forest, the trees harvested are replanted so that there will be more to use in the future
   b. US has numerous natural resources

E. World Population: the total number of human beings on our planet.
   1. Has generally increased slowly over time, even though it has peaks and valleys due to good and bad times (disease, famine, etc)
   2. In the last 100 years, and more specifically through the green revolution, that the population has grown so dramatically.
   3. Green revolution: term used to describe the modernization of agriculture including equipment, fertilizers, pesticides, and modern irrigation; all led to an exponential increase in production

II. Agricultural Commodities
A. Commodity: a raw agricultural product
B. Product: an agricultural product results from an agricultural process and is ready for consumption
C. Top five agricultural commodities for NC (2017)
   1. Broilers
   2. Hogs
   3. Turkeys
   4. Miscellaneous crops
   5. Tobacco
D. Top Five agricultural commodities nationally (2017)
   1. Cattle and calves
   2. Corn
   3. Soybeans
   4. Dairy products, Milk
   5. Broilers

III. Importing vs exporting practices related to agricultural commodities
A. Imports: a commodity brought in from abroad
   1. Top United States imports
      a. Bananas, coffee, tea, cocoa, spices
      b. Fresh and processed fruits
      c. Fresh and processed vegetables
   2. United States imports the most from the following countries
      a. China
      b. Canada
      c. Mexico
      d. Japan
B. Exports: a commodity shipped to other countries or places for sale or exchange
   1. Top three exports for the United States
      a. Soybeans
      b. Corn
      c. wheat
   2. United States exports the most to the following countries
a. Canada  
b. Mexico  
c. Japan  
d. China

IV. Production and processing issues related to food science  
A. Production: the creation of value; producing articles of value  
   1. Production of food and fiber
B. Manufacturing: changing a product into a useful form  
   1. Provides inputs for production sector  
      a. Fertilizer, chemicals, feed, machinery, processing plants  
   2. Processes food and fiber for sale to consumer  
      a. wholesalers and retailers, food brokers, groceries, fast food, restaurants
C. Marketing: preparing a product for sale or trade  
   1. Transports and sells outputs of manufacturing sector to producers and consumers  
      a. Transportation to retailers and wholesalers, sales of goods produced in manufacturing sector, agriculture businesses
D. Service: providing a helpful act or accommodation for something  
   1. Provides financing, service, and support for production sector  
      a. credit agencies, insurance companies  
      b. price supports, product research

V. Trends  
A. Trends: the general direction in which something tends to move; current style  
B. Trends in meat consumption  
   1. Beef  
   2. Pork  
   3. Poultry

VI. Advances of science and technology in the agricultural science industry  
A. 1793 – Invention of the cotton gin  
B. 1834 – McCormick reaper patented  
C. 1837 – John Deere began manufacturing steel plows  
D. 1843 – Sir John Lawes founded the commercial fertilizer industry  
E. 1862-75 – First American agriculture revolution  
   1. Change from hand power to horses
F. 1867 – Barbed wire invented  
   1. Ended era of open-range grazing
G. 1870s – Refrigerator cars introduced  
   1. Increase national markets for fruit and vegetables
H. 1881- Hybridized corn produced  
I. 1892 – John Froelich built first gasoline tractor  
J. 1900-10 – George Washington Carver found new use for peanuts, sweet potatoes, and soybeans  
   1. Diversifies southern agriculture
K. 1910-15 – Open-geared gas tractors introduced  
L. 1941-45 – Frozen foods popularized
M. 1945-70 – Second American agriculture revolution
   1. Change from horses to tractors
   2. Increased technological practices
   3. Increased productivity per acre

N. 1980s & 90s – Biotechnology becomes viable for improving crop and livestock products
   1. 1993 – Monsanto sells bovine somototrophin to dairy farmers to increase milk production
   2. 1994 – Tomatoes are genetically modified to delay the ripening process so they could be shipped and arrive to be sold
   3. 1994 – USDA approves the sale for Roundup Ready soybeans and cotton
   4. 1995 – Scottish scientist cloned a sheep, Dolly

O. 1994 – Satellite technology becomes popular to track and plan farming practices
   1. Precision agriculture

VII. Agriculture’s economic impact
A. U.S. farmer feeds 155 people
B. In Pakistan, people spend 50% of their income on food. In China it is 32%. Japan is 14%.
   1. The average U.S. consumer spends 10% of their income on food
C. Agricultural producers in the U.S. produce a lot of food.
   1. 2, 207, 504, 580, 00 pounds of food annually.
D. Every dollar spent on food pays several people. It pays the farmer, the processor, the wholesaler and so forth. For each dollar spent on food, the farmer receives 19 cents.
E. In 2017, the U.S. exported $138.15 billion to other countries.

VIII. Agriculture inventions with great impact on society
A. Cotton gin: 1793
B. U.S. Food Canning Industry established: 1819
C. John Deere Plow: 1837
D. Irrigation began in Utah: 1847
E. Mixed chemical fertilizers sold commercially: 1849
F. Mason jars used for home canning invented: 1858
G. Steam tractor: 1868
H. Barbed-wire invented: 1874
I. Milking machine developed: 1878
J. Gas tractor: 1892
K. George Washington Carver developed his method of crop rotation: 1896
L. Cooperative formed for artificial insemination of cattle: 1938
M. Frozen foods became popular: 1941
N. First grain elevator: 1942
O. No-till agriculture is used widely to help stop erosion: 1970
P. GPS is used in farming: 1994
Q. First biotech crops of soybeans and cotton available commercially: 1997

IX. Impact of agricultural research and technology
A. Technology: the application of science to a certain objective
   1. Agricultural technologies
a. Tractors
b. Combines
c. Biotechnology
d. Fertilizer
e. Irrigation systems

B. Research: investigation into a subject in order to discover facts, theories, and applications
   1. Artificial insemination vs Natural Breeding
   2. Till vs no till methods
   3. Synthetic fertilizers vs natural fertilizers
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<td>Interpret how agriculture supports life and how advances in the industry have helped society.</td>
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FFA New Horizons; www.ffa.org

### Suggested Activities 2.01

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Middle School Food and Agriculture Literacy Curriculum |
| 2.01.02         | Our Nation’s Commodities
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.03         | Are you Coming In or Going Out?
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.04         | The Process of Producing
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.05         | Agriculture Then and Now
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.06         | Advancing Through Time
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.07         | Don’t Touch That Dial – Agriculture’s Economic Impact
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.08         | Important Agriculture Inventions
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.09         | The Impact of Progress
Middle School Food and Agricultural Literacy Curriculum |
| 2.01.10         | King Cotton
National Agriculture in the Classroom |
**Note to teacher:** Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Agriculture career opportunities
   A. Career vs. job
      1. A career is an occupation or profession, usually requiring special training and may be considered lifework for an individual.
      2. A job is a specific task done as part of a routine or could be a post of employment either part-time or full-time
   B. Identify career clusters
      1. Agribusiness Systems
      2. Animal Systems
      3. Biotechnology Systems
      4. Environmental Service Systems
      5. Food Products and Processing Systems
      6. Natural Resource Systems
7. Plant Systems
8. Power, Structural, and Technical Systems

C. Identify careers within each career cluster
   1. Agribusiness Systems: international agri-marketing specialist, agricultural loan officer, agricultural commodity broker, farm/ranch manager, agricultural economist, livestock buyer/seller, feed/farm supply store manager, agricultural products buyer, agricultural salesperson
   2. Animal Systems: animal geneticist, aquaculturalist, animal nutritionist, animal scientist, poultry manager, embryo technologist, veterinarian, feed sales representative, artificial insemination technologist
   3. Biotechnology Systems: animal geneticist, plant geneticist, research technician, embryo technologist, forestry geneticist, lab technician, biotechnology engineer
   4. Environmental Service Systems: pollution prevention and control manager, environmental sampling technician, health and safety sanitarian, hazardous materials handler, water environment manager, toxicologist, solid water disposer/recycler, environmental compliance assurance manager, water quality manager
   5. Food Products and Processing Systems: food scientist, food and drug inspector, toxicologist, biochemist meat cutter-grader, food and fiber engineer, product buyer, meat processor
   6. Natural Resource Systems: wildlife manager or technician, water monitoring technician, park manager or technician, natural history interpreter, fish and game officer, forest worker or logger forest manager or technician, fisheries manager or technician, mining engineer or technician
   7. Plant Systems: plant breeder ad geneticist, soil and water specialist, certified crop advisor, botanist, tree surgeon, education and extension specialist, golf course superintendent, greenhouse manager, forest geneticist
   8. Power, Structural, and Technical Systems: remote sensing specialist, global positioning systems technician, agricultural engineer, recycling technician, equipment parts manager, machinist, communication technician, welder

II. Differences between job and career
A. Job
B. Career
C. Salary
D. Training
E. Fulltime/Part-time

III. Implement a plan to achieve career goals and priorities
A. Review seven career pathways and associated careers
B. Define career, goal, and priorities
C. Organize the steps to career planning
   1. Identify career goals and priorities
   2. Define Agriculture Pathway Interest
3. Identify high school classes that will help me reach my goal
4. Identify and choose SAEs that will help me reach my career goal
5. Identify possible resources to reach my career goal
6. Celebrate and review

IV. Components of a Resume
A. Resume: the tool we use to tell about ourselves, to share our skills and experience
B. Common Components of resumes
   1. Job objective
   2. Education
   3. Work Experiences
   4. Skills or capabilities
   5. Significant accomplishments
   6. Activities or organizations
   7. Honors or Awards

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<td>Understand the importance of agriculture to our social and economic well-being.</td>
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<td>Understand skills and careers in the agricultural science industry.</td>
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Sources of Information:
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National Agriculture in the Classroom; agclassroom.org
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Suggested Activities 2.02

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<td>2.02.04</td>
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<td>2.02.05</td>
<td>Careers in Environmental Systems</td>
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<td>Who Works in Food Processing</td>
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<td>2.02.07</td>
<td><strong>Where Will Natural Resources Take You?</strong>  Middle School Food and Agricultural Literacy Curriculum</td>
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<td><strong>Plant Systems Careers</strong>  Middle School Food and Agricultural Literacy Curriculum</td>
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<td><strong>Power, Structural, and Technical System Careers</strong>  Middle School Food and Agricultural Literacy Curriculum</td>
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<td><strong>Exploring Agribusiness</strong>  Middle School Food and Agricultural Literacy Curriculum</td>
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<td>2.02.11</td>
<td><strong>Career Goals and Priorities</strong>  Middle School Food and Agricultural Literacy Curriculum</td>
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<td>2.02.12</td>
<td><strong>Components of a Resume</strong>  Middle School Food and Agricultural Literacy Curriculum</td>
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<td>2.02.13</td>
<td><strong>AgExplorer Implementation Guide</strong>  National FFA Organization, <a href="http://www.agexplorer.com">www.agexplorer.com</a></td>
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<td>2.02.14</td>
<td><strong>AgExplorer Exploration</strong>  National FFA Organization, <a href="http://www.agexplorer.com">www.agexplorer.com</a></td>
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<td>2.02.15</td>
<td><strong>Battle of the Best: Agriculture Careers</strong>  National FFA Organization</td>
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<td>2.02.16</td>
<td><strong>When I Grow Up: Discover Ag Careers</strong>  National Agriculture in the Classroom; agclassroom.org</td>
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</table>
## Natural Resources within the agricultural industry

### A. What is a natural resource?

1. Natural resource: naturally occurring material that is valuable to people, plants, and wildlife.
   a. Soil
   b. Water
   c. Air

### B. Natural resource used in agriculture

1. How are natural resources used in agriculture?
   a. Power machinery and equipment
   b. Provide essentials for plant growth
   c. Provide essentials for animal production

### C. Renewable Resources

1. A resource that can be replenished when used through natural or human processes.

2. Type of resources considered renewable
   a. Soil
   b. Trees
   c. Water
   d. Crops
   e. Wind
   f. Solar
   g. Geothermal
D. Non-Renewable Resource
1. A resource that cannot be replaced after being used through natural or human processes.
2. Types of Resources considered non-renewable
   a. Petroleum oil
   b. Gold
   c. Coal
   d. Natural Gas
   e. Propane
   f. Uranium
   g. Fossil Fuel
   h. Diesel

E. Conservation of Natural Resources
1. Consumption: to use or use up
2. Conservation: to use or manage wisely
3. Preservation: to maintain and reserve for continued survival
4. Personal responsibilities in conservation and preservation of natural resources
5. Importance of natural resources
   a. Loss of resource
   b. Limited qualities
   c. Lifestyle changes
   d. Conscience consumer

F. Importance of Air
1. Air is a mixture of gases that surround us that is invisible, tasteless, and odorless.
   a. Plants use air in the photosynthesis process that allows plants to produce food.
   b. Animals and humans breathe in air to exchange gases from natural body functions.
   c. Plants, animals, and humans would not survive without air.
2. Impact of poor air quality on plants, animals and humans
   a. Plants could produce poor fruit and have damage to their leaf tissue.
   b. Animals and human can develop breathing problems, as well as certain respiratory diseases caused by poor air quality.
3. Air pollution
a. Air pollution is the contamination of the air by smoke and other harmful gases.
   1) Carbon dioxide and carbon monoxide are gas pollutants caused by the burning of materials often from the petroleum industry.
      - Car exhaust, combustion engines
   2) Sulfur oxides are found in the air as a result of burning a fuel containing sulfur.
      - Examples: burning of coal or oil
      - If high enough levels are present, sulfur oxides will emit a “rotten-egg” smell.

b. An air pollutant is any material that causes air pollution.
   1) Particle pollutants are small particles of dust or liquid that pollute the air.
      - Examples: smoke from factories, burning trash, forest fires, and dust from a dirt road.

G. Impact of water quality
   1. Water quality – the condition of water for a particular use.
   2. Affects of water quality
      a. The way people use and abuse water will affect its quality.
      b. Natural occurrences – weather, earthquakes, etc.
      c. Plants, animals, and humans all require water in order to survive. If the condition of water is not suited for a particular use, then the quality of the life of a plant, animal or human would be compromised.
   3. Water cycle – the movement of water from the earth to the atmosphere and back to the earth to renew and refresh water resources found on earth.
      a. Water is recycled by moving through the earth’s environment and the water cycle.
   4. Movement of water through the water cycle
      a. Water travels from the earth’s surface to the atmosphere through evaporation. Evaporation is the conversion of water from liquid to gas form by the exposure to heat.
      b. Water is released as water vapor by plants into the atmosphere through transpiration. Transpiration is the process of plants releasing water from their leaves.
      c. As water vapor rises in the atmosphere, it begins to col and turn back into water. This process is called condensation.
      d. As water vapor condenses, clouds are formed. As the vapor droplets become large, rain is formed and falls to the earth’s surface as precipitation.
e. When water reaches the ground, it enters waterways such as rivers, lakes, and oceans. Precipitation can also enter the ground and become a part of the groundwater system.

f. Water is then brought to the earth’s surface, and the process is tared again through evaporation or transpiration.

5. Water as non-renewable resource
   a. Water pollution – the addition of harmful chemicals or substances to water
   b. When water becomes polluted, it becomes a nonusable resource.
   c. When water becomes polluted, the water cycle is not enough to renew and refresh our water resources.

6. Point vs. Nonpoint water pollution
   a. Point source water pollution occurs when the contaminant comes from an obvious source.
      1) Point source contaminants come from industrial, commercial, and residential. Often there are waste products that are a byproduct of daily operations.
      2) Examples of point pollution include: tanker oil spill in water, animal waste treatment lagoon spills, or waste water treatment facilities.
   b. Nonpoint source water pollution occurs when the contaminant comes from a source that is not easily identifiable or from a number of sources.
      1) Nonpoint pollution often originates as precipitation and collects contaminants as it travels across the ground until it becomes polluted.
      2) Nonpoint found over a large area is hard to pinpoint the exact origination of the contamination
      3) Examples of nonpoint pollution include: agricultural or urban runoff (Fertilizers,) runoff from parking lots (grease, gasoline,) salt contamination from road de-icing.

H. Soil
1. Soil profile – a vertical cross section of the soil
   a. Shows layers of soil beneath the surface that vary depending on location of profile.
   b. Top layers of a soil profile are nutrient rich for plant growth.
2. Soil erosion – the process by which soil is moved
   a. The wearing away of the earth’s surface by wind, water or ice, or other geological processes.
   b. Causes of soil erosion
      1) Erosion is often caused by weather, for example wind or water
2) Soil erosion can be caused by human activity, such as construction and plowing.

c. Impact of soil erosion

1) Top layers of a soil profile are rich in nutrients are moved and land becomes poor due to lack of quality soil.

2) Loss of topsoil. Topsoil provides the best root environment by providing the best structure, the most air and living organisms. Topsoil contains most of the soil’s organic matter and plant nutrients.

3. Soil quality – the ability of soil to perform functions that are essential for people and the environment.

a. Soil provides for animals

1) Plants are the basis of a food chain; therefore, plants provide nutrition for animals
   - Animals rely on healthy plant growth to ensure proper nutrition. With poor soil quality, plant growth will be limited, impacting animals’ lives in a negative way.

2) Pastures/grazing lands

3) Habitat for wildlife

b. Environmental impact

1) When soil quality decreases, plant life will become limited and result in less abundance for animal consumption. Pollution can have a direct impact on soil quality. Oil spills, chemical spills, and landfills will result in a decrease in soil quality.

4. Growing Media – used in place of soil, growing media provides aeration, drainage, and water holding capacity for plants growing in a container. Can be bought pre-mixed or by individual component.

a. Components of growing media

1) Peat moss, or the partial decomposition of plant material, provides good air and water holding capacity for plants as well as a good base for any growing medium.

2) Wood residues, such as bark or bark ash, provide large pore spaces to promote good aeration and drainage.

3) Vermiculite, or sterile lightweight mica, is able to store large amounts of water and air.

4) Perlite, sterile lightweight porous material, provides good aeration, but store little water

b. Support of plant growth

1) Provides good anchorage for plants
2) Provide adequate air space for root respirations
3) Able to hold sufficient amount of water and nutrients required for plant growth

5. Soil test: using various tests to measure properties that affect how well soil will support plant growth.
   a. Collection procedure
      1) Collect sample from five to ten sites within area being tested.
      2) Mix individual samples to get composite sample for area.
   b. Test procedure
      1) Combine tablespoon sample with distilled water
      2) Insert test paper into solution for one minute.
      3) Remove strip from sample solution and rinse with distilled water
      4) Evaluative analysis: determine the pH of the soil sample according to the chart.
      5) Interpretation: what the pH measure indicates (acidic, neutral, basic.)

6. Tissue testing: a scientific test to analyze plant tissue to determine the level of nutrients in the plant itself. Can be used as a way to see if something is hindering nutrient uptake.
   a. Collection procedure
      1) Cut the oldest mature leaf from the plant.
      2) Plant sap should be extracted from the midrib or petiole of the leaf using pliers.
   b. Test procedure
      1) Follow the procedure outlined in the plant tissue test kit instructions.
   c. Interpret results
      1) Visual appraisal of sap analysis graph showing elements present in plant tissue
      2) Evaluate analysis of graph to determine levels of each element
      3) Interpretation: according to the sap analysis, what elements are lacking in the plant.

I. Forestry
1. Tree parts and functions
   a. Crown: composed of the leaves, branches, twigs, and flowers. The crown’s primary function is food production.
   b. Roots: underground structures that anchor the tree and take up water, nutrients, and minerals from the soil
c. Trunk: transfers water and nutrients from the roots to the crown. The trunk is the source of the most useful wood in a tree.
   1) Heartwood – composes most of the trunk and is made up of dead xylem cells. Like the backbone that supports the tree.
   2) Sapwood – the living xylem that transports water and nutrients up from the roots.
   3) Cambium layer – cell layer that produces new bark (phloem) and new wood (xylem) every year.
   4) Inner bark – supply line that carries food from leaves to branches, stem, and roots
   5) Outer bark – dead phloem cells that protect the tree from diseases and insects

2. Forestry products and their sources
   a. Wood products – baseball bat, pencil, ruler, lumber, plywood, furniture, railroad tie, particle board, pallets, fuel, charcoal, flooring
   b. Cellulose products (cellulose is a complex carbohydrate that constitutes the chief part of the cell walls of higher plants and yields fiber for many products.) – Paper products including writing paper, toilet paper, magazines, books, rayon fabric, twinkies, multivitamins, shatterproof glass, medications, dinner ware, electrical receptacles, toys, handles for cooking utensils
   c. Bark products – cinnamon, cork, mulches, soil conditioners, bedding for poultry and livestock, plywood adhesives, plastic fillers, lacquers, varnishes, molded products
   d. Sap products – bandage strips, perfumes, candles, crayons, paint thinner, chewing gum, syrup, cosmetics, soaps, rubber products, shoe polish, printing ink, varnishes, cleaning fluids
   e. Fruit, leaves, and seed products – oranges, apples, applesauce, bananas, mangoes, pine nuts, pecans, peaches, walnuts, bay leaves, nutmeg, cider, dyes

3. Calculations in the forestry industry
   a. Calculating the number of acres in a tract of land
      1) Area = Length (feet) x Width (feet)
      1 Acre = 43, 560 square feet
      2) Example: How many acres in a tract of forest land that measures 1,875’ long and 150’ wide?
      Area = 1, 875’ x 150’ = 281, 250 feet
      281, 250/43, 560 = 6.46 acres
   b. Calculating the Diameter Breast Height or DBH – the diameter of the tree at four and one half feet above the ground.
1) Measured with a device called a dendrometer, but also can be measured with a diameter tape or a Biltmore stick.

2) When calculating the DBH the measurement is always rounded to the nearest inch measurement. (Ex. A tree measuring 5.5” would be rounded up to 6”. If the tree measured 8.24”, it would be rounded down to 8”)

c. Calculating Board Foot – the standard unit of measurement for most lumber. It is a measurement equal to a piece of wood one inch thick, one foot wide, and one foot long.

1) Formula for board feet:
\[ \text{length (feet)} \times \text{width (inches)} \times \text{thickness (inches)} \div 12 \]

d. Calculating the Number of Sawlogs: 16-foot logs that are free of large knots and at least eight to ten inches in diameter.

1) Foresters calculate the number of sawlogs by taking the measurement of the height of the tree and dividing by 16, then they round to the nearest 0.5.

e. Using the Board Foot table to calculate the number of board feet in each tree measured.

<table>
<thead>
<tr>
<th>dbh</th>
<th>1 16' Log</th>
<th>1.5 16' Log</th>
<th>2 16' Log</th>
<th>2.5 16' Log</th>
<th>3 16' Log</th>
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</tr>
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<td>61</td>
<td>69</td>
<td>77</td>
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<td>138</td>
<td>160</td>
<td>196</td>
<td>196</td>
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4. Harvesting techniques used in the forestry industry

a. Silviculture – the art and science of managing and regenerating forests to control their composition, structure, and growth.

1) Clear-cutting system – a system that requires removing all of the trees in a stand (defined as a group of tree similar enough in species composition, condition, and age distribution to be considered a unit. However the trees may or may not be the same age.) Seedlings are planted to establish a new stand. New trees can also regenerate from the seeds from a nearby stand or from the forest floor.

2) Seed-tree system – a system that removes the majority of mature trees but leaves a few good seed-producing trees. These seed trees will produce the seeds to establish a new stand.
3) Shelterwood system – this harvesting method removes certain trees to establish new seedling growth under the protection of the trees that are left. Enough mature trees are left to shelter the site until the new growth is well established.

4) Group selection system – small groups of mature trees are harvested and intermediate size trees are thinned frequently. This system resembles a miniature clear-cut and is advantageous to wildlife that has adopted to the older forest habitat.

5) Single-tree selection system – each tree’s individual merit is considered and the trees are selectively harvested as they mature, leaving the majority of trees on a site standing. This system is also used remove dead and diseased trees to protect the health of the forest.
<table>
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<tr>
<th>COURSE</th>
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<th>AGRICULTURE &amp; THE ENVIRONMENT</th>
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<td>Understand the relationship between natural resources and the production of food and fiber.</td>
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<tr>
<td>OBJECTIVE:</td>
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<td>Explain the importance of natural resources in the agricultural industry</td>
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Activity Contributors:
Middle School Food and Agricultural Literacy Curriculum
https://www.ffa.org/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum
Scott Robinson, Agriculture Instructor, Rolesville Middle School

**Suggested Activities 3.01**

<table>
<thead>
<tr>
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| 3.01.01 | Lesson 8.4 Natural Resources in the Agricultural Industry  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.02 | Lesson 1.1 Renewable vs. Non-renewable  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.03 | Lesson 1.2 Are natural resources really that important?  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.04 | Lesson 2.1 Types of Air Pollution  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.05 | Lesson 3.1 Not a Drop to Drink – Understanding the Impact Water Quality has in Sustaining Life  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.06 | Lesson 3.2 My Water’s Been Where – Understanding the Water Cycle  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.07 | Lesson 3.3 When Water becomes Unusable  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.08 | Lesson 3.4 Understanding Point vs Nonpoint Source Water Pollution  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.09 | Lesson 4.1 The Effects of Soil Erosion on Soil Profiles  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.10 | FFA New Horizons: From the Ground Up |
| 3.01.11 | Lesson 4.2 The Effects of Soil quality on Animal Life  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.12 | Lesson 4.3 The Effects of Soil Quality on Animal Life  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.13 | Lesson 4.4 You are the Scientist  
Middle School Food and Agricultural Literacy Curriculum |
| 3.01.14 | Lesson 5.1 You are Barking up the Right Tree  
Middle School Food and Agricultural Literacy Curriculum |
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<td>Lesson 5.2 Would you Believe It’s for the Tree</td>
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<td>Lesson 5.3 The Amazing Race in the Forest</td>
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<td>FFA New Horizons: Future of Forestry</td>
<td><a href="http://www.ffa.org">www.ffa.org</a></td>
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### Alternative Energy: describes energy sources that are still in development.

#### A. Types of alternative energy

1. **Solar energy** – energy that is produced from the sun whether its’ in the form of sunlight particles that can create electricity (solar electricity or photovoltaics) or in the form of heat to warm water or air space.

2. **Wind energy** – energy that is produced from the natural movement of the wind; also considered a form of solar energy because wind is created by differences in the amount of heat that the sun sends to different parts of the earth.

3. **Biomass energy** – energy that comes from materials that were once living, like plants or animal waste.

4. **Geothermal energy** – energy that comes from heat generated deep inside the earth from items like hot rocks, hot water, and steam.

5. **Hydroelectric energy** – energy that is produced from moving or falling water.

6. **Tidal/wave energy** – energy that is produced when ocean tides or waves change or move across the ocean or sea.

#### B. Types of alternative energy used in agriculture

1. **Solar energy** can be used in agriculture to save money by cutting a farm’s electricity and heating bills and reduce pollution.
   - Solar panels (photovoltaic cells) provide power for farm operations such as remote electric fences, gate openers, water pumps, lights, and water tank de-icers.
   - Solar greenhouse collect and store solar energy as heat.
   - Solar heat collectors warm livestock buildings and greenhouse.

2. **Wind energy** among the cows and crops, farmers have a new income as huge towers with propellers turn and change the energy from the wind into electricity.
a. Wind turbines allow farmers to collect land use fees from electric companies and still use the land for agricultural purposes.

b. Windmills pump water for animal drinking tanks.

3. Biomass (plants and organic waste) produced from plants and organic wastes – When crops such as cotton, rice, peanuts, and sugar cane are harvested, there are large amounts of waste materials that are left behind. Items such as crop residue and effluent from confined animal feeding operations (CAFO) can be used for fuel. Small biomass energy projects can provide many needed benefits in rural areas that are involved in agriculture. Example: a biomass generator that uses manure as its energy source is installed on a feedlot. This would solve the feedlot’s problem of manure disposal, reduce odors, and provide jobs for the community.

a. Ethanol – an alternative fuel; a liquid alcohol fuel with vapor heavier than air; produced from agricultural products such as corn, grain, sorghum, and sugar cane.

b. Biodiesel – a fuel that is similar to diesel fuel and is derived from vegetable sources such as soybeans

c. Methane: an odorless gas produced by the decomposition of organic matter from bio-waste (human, plant or animal material) such as pig manure. Anaerobic bacteria break down the waste giving off methane in a methane digester. Sludge from the methane digester is used for fertilizer.

C. Apply alternative energy sources for future agricultural use

1. Wind Energy
   a. Wind turbines: a wind-driven turbine for generating electricity
   b. Environmental Impacts

2. Solar Energy
   a. Passive solar water heating: a water heater that uses the sun’s energy to heat water and that requires no moving parts and no external energy except the sun.
   b. Passive solar design: the use of sunlight to heat and cool buildings
   c. Solar photovoltaic cells: convert sunlight into electricity: made from layers of semiconductor materials (silicon.)
   d. Advantages of photovoltaics
   e. Disadvantages of solar energy

3. Biomass Energy
   a. How biomass works
   c. Ethanol: an alternative fuel; a liquid alcohol fuel with vapor heavier than air; produced from agricultural products such as corn, grain, and sugar cane.
d. Biodiesel: a fuel that is similar to diesel fuel and is derived from usually vegetable sources (such as soybean oil.)
e. Environmental impact

D. Alternative energy sources produced by agriculture
   1. Wind Energy
   2. Biofuel – a fuel composed of or produced from biological raw materials.
      a. Biodiesel
      b. Ethanol
      c. Methane
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Understand the relationship between natural resources and the production of food and fiber.

Understand the role of alternative energy as it relates to the agricultural industry.

Activity Contributors:
Middle School Food and Agricultural Literacy Curriculum
https://www.ffa.org/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum
Scott Robinson, Agriculture Instructor, Rolesville Middle School

**Suggested Activities for 3.02**

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<td>Lesson 6.1 Energize Me…the Alternative Way Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>3.02.02</td>
<td>Lesson 6.2 Solar, Wind or Biomass – Who will be the next alternative energy Star for Agriculture: Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>3.02.03</td>
<td>Lesson 6.3 Back to the Future…Agriculture Style Middle School Food and Agricultural Literacy Curriculum</td>
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<td>3.02.04</td>
<td>Lesson 6.4 Plants in Your Gas Tank... Farmers Fueling Our Future Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>3.02.05</td>
<td>Lesson 6.5 Alternative Energy Jeopardy Middle School Food and Agricultural Literacy Curriculum</td>
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Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA

Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Role of production agriculture practices in the environment
   A. Production Agriculture – raising domesticated plants and animals for human consumption
      1. Impact of Production Agriculture on the environment
         a. Water quality can be affected in positive and negative ways
         b. Strong odors can be given off by farms
         c. Farming could increase or decrease soil erosion depending on the practices
         d. Machinery and animals can be noisy to neighboring areas
         e. Production agriculture balances the carbon cycle
         f. Habitat for wildlife can be supported by production agriculture
   B. Agriculturalists as stewards of the environment
      1. Environmental stewardship – the responsibility of humans to manage and care for the whole natural environment, not just the parts that benefit the human race
      2. Agricultural producers rely on environmental resources for their operations and, therefore, must take care of the environment
      3. Agricultural producers must make management decisions that will decrease environmental impact
         a. Not allowing farm animal waste to enter drinking water sources
         b. Limit the amount of pesticides and fertilizes used on soil
         c. Cover stock-piled animal manure and bedding to prevent water contamination
         d. Maintain healthy plants in pastures to prevent erosion
         e. Use fencing to control where animals have access
         f. Agricultural producers should learn about, plan for, and carry out best management practices for their farm

II. Impact of a Good Steward
    A. Environment – the sum total of all the external conditions that may act upon an organism or community to influence its development or existence
    B. Pollution – the presence of substances in water, air, or soil that impair usefulness or render it offensive to humans
C. Stewardship – the careful and responsible management of something entrusted to one’s care

D. Animal production has an impact on the environment
   1. Grazing – to feed on growing grass and pasturage, as do cattle, sheep, etc.
      a. Reduces the need for mechanical practices (mowing) and weed management (spraying)
      b. It is in the best interest of producers to take care of land to ensure longevity of their operations
      c. Rangelands are in the best condition they have been in during the past century; however, overuse of the land can potentially lead to erosion

2. Animal manure used as fertilizer
   a. Can reduce the need for commercially produced fertilizers
   b. Natural high quality fertilizer
   c. Once the decomposition has taken place there is no harm to the environment; however, prior to this point animal manure that enters the water supply can become a potential form of pollution

3. Animal manure used as a fuel source
   a. Methane gas produced by animals can be collected and used as a fuel source
   b. Potential to reduce the need for commercially produced fuels
   c. When the biogas is used it potentially releases less pollution into the air

III. Reducing Animal Effects on the Environment
   A. Outline methods of reducing the effects of animal agriculture on the environment
      1. Waste management

   I. Odor control
      A. State and local regulations
      B. Mix oxygen with manure
      C. Use of masking agents

   II. Manure management
      A. Fertilizer – create economic and environment benefits
      B. Methane from manure
         1. Manure mixed with water and pumped into covered lagoons
         2. Manure heated and mixed to produce biogas where a covered digester catches methane

   III. Water Quality
      A. Contamination of water supply
         1. Adequately plan facility building and drainage systems
         2. Manage runoff and use soil conservation practices in crop fields where manure is applied as a fertilizer

IV. Common environmental applications and impacts of plant production
   A. Plants are essential for life on earth – All living organisms rely on plant mater directly or indirectly for energy (food.) For hundreds of years, humans have been planting and harvesting thousands of acres of plants to meet our needs for food and shelter. However, crop production often leads to negative effects as well.

   B. Positive impact of plants on the environment
1. **Primary Producers** - Plants are called primary producers because they are the only living organisms that are capable of producing their own energy from the sun rather than from other animals or plants.

2. **Erosion** - the loss of soil, sand, and rocks from the earth’s surface due to wind and rain.
   a. Plants are often used to slow and reduce erosion because their roots help hold the soil in place rather letting it stream or blow away.
   b. Plants help absorb water deep into the ground to prevent fast-flowing streams that may create gullies.
   c. Man-made boundaries may be used to control erosion, plants are often the most affordable, practical and long-term solution.

3. **Greenhouse gas storage**
   a. Common greenhouse gases are carbon dioxide, methane, and nitrogen. These gasses are released as fossil fuels are burned, through agricultural plant and animal production, and through natural earth processes.
   b. Greenhouse gases are the major cause of gradual global warming (a general increase in temperature of the earth’s surface over time.)
   c. Plants are the best tool for reducing the effects of greenhouse gases. Trees and plants store large amounts of these gases in their tissues keeping the gases from reaching the atmosphere. And during the process of photosynthesis, plants convert carbon dioxide into oxygen (what we breathe.)
   d. Plants have additional value.
      1. Plants help reduce noise pollution – often planted between busy roadways and residential areas to reduce the noisiness.
      2. Trees provide shade along the roadway – prevent sunlight from hitting drivers directly in the eye and causing wrecks
      3. Plants have medical uses – pharmaceutical drugs and therapy treatments
      4. Aesthetic value of plants – their beauty not only helps increase property value for homeowners, but also has been proven to have positive impact on a person’s mood and work efficiency, and believed to hasten recovery time for hospital patients.

C. **Negative impacts plant production may have on the environment**
   1. Erosion – crop production is often a leading cause of erosion
      a. Because large areas of land are cleared for use as cropland to grow fruits, vegetables, and grains, a large portion of the surface of the soil is left vulnerable to erosion.
      b. Convention farming practices are often accused of being the largest cause of erosion problems in the United State because of the common practice of plowing up the soil and dead plants before planting new crops. Tilling the soil loosens the top layer making the soil more apt to run off in heavy rains.

   2. **Greenhouse gas emission**
      a. When land is cleared to make way for crops to be planted and harvested, the greenhouse gases that were once stored in the plants and the oil are released into the atmosphere.
b. When land is cleared, there are fewer trees to convert carbon dioxide into oxygen.
c. Planting, harvesting, and transporting plant products for human and animal consumption requires the use of gas and diesel to power tractors, tractor trailers, and processing equipment. Burning these fossil fuels releases even more greenhouse gases into the environment.

3. Chemical contamination
   a. Use of pesticides in common plant production, specifically insecticides, which are used to kill or repel damaging insects
   b. Fertilizers may cause other contamination, which are nitrogen-based solutions that are used to increase healthy growth in plants
   c. Overuse or misuse of chemical fertilizers and pesticides leads to chemical runoff into water sources which could affect entire ecosystems. Most insecticides used today are not pest-specific and will therefore potentially harm even harmless insects.

V. Responsible Agriculture
   A. Environmental stewardship
      1. Agricultural practices that consciously work to protect the environment from the potential harm that may result from agricultural production.
      2. Examples of stewardship practices in agriculture
         a. Low tillage farming
            1. Problem: Conventional farming practices are often accused of being the largest cause of erosion problems in the United States because of the common practice of plowing up the soil and dead plants before planting new crops. Tilling the soil loosens the top layer making the soil more apt to run off in heavy rains. Also, tilling the soil requires mechanical plows which burn fuel releasing greenhouse gases into the air.
            2. Solution: Increase popular methods of preventing erosion on cropland is called low-tillage or no-tillage farming. In no-tillage farming, new crops are planted directly in undisturbed soil using ad rill or seed press. Because the topsoil is left intact, erosion is less severe and the soil is able to hold more CO2 that would otherwise be released into the atmosphere.
         b. Insects as natural pest control
            1. Problem: The use of pesticides, specifically insecticides, which are used to kill or repel damaging insects. Critics say that overuse of chemical insecticides leads to chemical runoff into water streams which could affect entire ecosystems. Most insecticides used today are not pest-specific and will therefore potentially harm even harmless insects.
            2. Solution: Use of other insects and animals to naturally control insect infestations.
               i. Lady beetles are a great tool to use against aphid problems
               ii. Toads will consume tons of insects from gardens
iii. Farmers are experimenting with the use of chickens as natural insecticides because they love to much on beetles, caterpillars, and snails

c. Other environmental stewardship practices
   1. Organic farming – raising livestock or growing plants that do not use chemical fertilizer, pesticides, or hormones.
      i. Use natural ingredients to reduce the effect farming may often have on the environment
   2. Hydroponics – the practice of growing plants in the absence of soil
      i. Many plants such as strawberries, grow very well in a greenhouse in the absence of soil
      ii. This method saves water because the water goes directly to the root and does not run off through soil
<table>
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**ESSENTIAL STANDARD:**

| 4.00   | 8%    | B2   |

Understand how environmental stewardship within the agricultural industry relates to natural resource stewardship.

**OBJECTIVE:**

| 4.01   | 5%    | B2   |

Explain the environmental impact of plant and animal production.

Activity Contributors:
Middle School Food and Agricultural Literacy Curriculum
[https://www.ffa.org/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum](https://www.ffa.org/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum)

**Suggested Activities 4.01**

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Understand how environmental stewardship within the agricultural industry relates to natural resource stewardship.

### OBJECTIVE:

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<th>COURSE</th>
<th>EXPLORING AGRICULTURAL SCIENCE</th>
<th>AGRICULTURE &amp; THE ENVIRONMENT</th>
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Exemplify strategies for effectively using resources in the agricultural industry.

**Sources of Information:**

Middle School Food and Agricultural Literacy Curriculum – National FFA

**Note to teacher:** Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Reducing, reusing, and recycling.
   A. What does it mean to reduce water?
      1. Reduce: use fewer resources (which, in turn, reduces trash)
      2. Methods of reducing use of resources and trash
         a. Buy used products
         b. Select products which are energy – efficient
         c. Avoid overly packaged goods because packaging is all throw away
   B. What does it mean to reuse?
      1. Reuse: taking an item that might be thrown out and using it again for a purpose other than its original use (or allowing someone else to use it instead of throwing it out)
      2. Items that can be used
         a. An old shirt can become a rag used for cleaning
         b. An old envelope can become a shopping list or a note
         c. Magazines, CDs, and DVDs can be shared or traded
   C. What does it mean to recycle?
      1. Recycle: process old, used items in order that the material can be used to make new products
      2. Items that can be recycled
         a. Paper
         b. Metal
         c. Glass
   D. Why is it important to reduce, reuse, and recycle?
      1. Conserve natural resources
      2. Save energy
      3. Decrease pollution
      4. Protects the environment

II. Conservation techniques and strategies
A. What does conservation mean?

B. Examples of natural resources that can be conserved
   1. Water
      a. Plant things that don’t require a lot of water
      b. Install a water-saving shower head
      c. Never put water down the drain when there may be another use for it such as watering a plant or garden, or cleaning
      d. Avoid flushing the toilet unnecessarily; dispose of tissues, insects and other such waste in the trash rather than the toilet
      e. Turn off the water while brushing your teeth.
      f. Operate automatic dishwasher and clothes washers only when they are fully loaded
   2. Soil
      a. Plant leafy plants that can break the force of falling raindrops
      b. Maintain portions of unttiled land between gardens and fields of crops because a patch of grassy land can help stop water erosion
      c. Avoid overstocking livestock in pastures, preventing stripping down of vegetation to the soil leaving it subject to erosion by wind or rain
      d. Grow plants that are native to the region whenever possible; native plants will have millions of years of evaluation on their side to help conserve the soil
      e. Construct a natural windbreak to line the perimeter of a farm field to prevent gusts of wind from disrupting the soil when a crop has been recently planted
      f. Conserve soil between crop rotations by planting cover crops to help fight erosion and lock nutrients in the soil
   3. Trees
      a. Reuse manila envelopes and file folders
      b. Use scrap paper for informal notes to yourself and others
      c. Print or copy on both sides of the paper
      d. Reuse brown paper bags to line your trash can instead of plastic liners
      e. Write to companies that send unwanted junk mail…ask them to take you off their list
      f. Use washable rags, not paper towels, for cleaning spills and other household chores
   4. Fossil fuels
      a. Buy locally grown food and locally made products when possible
      b. Recycle engine oil
      c. Keep tires properly inflated to save fuel
      d. Carpool
      e. Use public transit
      f. Ride a bike or walk instead of driving
   5. Energy provided by various resources
      a. Use the stairs instead of the elevator
b. Turn the heat down and wear a sweater
c. Turn the lights off when leaving a room
d. Don’t use electrical appliances for things than can easily be done by hand
e. Buy energy-efficient compact fluorescent bulbs: although they cost more initially, they save money in the long run by using only ¼ the energy of an ordinary incandescent bulb and lasting 8-12 times longer
f. Plant shade trees near housing

III. Personal product choices and the environmental impact
A. What are personal product choices?
   1. Personal product choices: selections made by an individual based on his/her personal preferences
      a. Caffeinated soda vs. non-caffeinated soda
      b. An SUV vs. a compact car
      c. Wheat bread vs white bread
B. How do our personal product choices impact the environment?
   1. Food – location where food is produced and purchased
      a. Buy locally produced foods such as fruits and vegetables to avoid the extra energy costs associated with the production and transportation of processed foods
      b. Eat species of fish that are not overfished (cod, salmon, grouper)
      c. Instead of bottled water, buy a reusable water container
   2. Paper products – is there an option to purchase products made from recycled paper?
      a. Notebook paper used in school
      b. Tissue
      c. Napkins and paper towels
   3. Packaging – packaging can be wasteful
      a. Avoid products that are overly packaged
      b. Buy items in bulk because it reduces packaging waste
      c. Choose paper bags over plastic bags because plastic is not biodegradable
   4. Transportation – privately owned vehicles that use fossil fuels are not always necessary means of transportation
      a. Walk or use a bicycle instead of a car
      b. Use public transportation such as buses if possible
      c. Encourage car-pooling
   5. Energy efficiency – some products are more energy efficient than others
      a. Use rechargeable batteries
      b. Purchase low-energy fluorescent light bulbs that last longer
      c. Perform regular maintenance on large appliances to extend their usable life

IV. Reduce negative environmental impact
A. What does negative environmental impact mean?
   1. Anything that poses a threat to or harms the environment
B. What are examples of negative environmental impact and how can the impact be reduced?

1. Using excessive amounts of paper
   a. Recycle the paper instead of throwing it away

2. Excessive use of energy when unnecessary
   a. Use the stairs instead of an elevator
   b. Turn off lights when leaving a room
<table>
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Activity Contributors:  
Middle School Food and Agricultural Literacy Curriculum  
https://www.ffa.org/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum

### Suggested Activities 4.02

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<td>Reduce, Reuse, Recycle</td>
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<td>4.02.02</td>
<td>Conservation Strategies</td>
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<td>4.02.03</td>
<td>Personal Product Choices</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>4.02.04</td>
<td>Reducing Negative Environmental Impact</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>4.02.05</td>
<td>Mathematical Concepts in Natural Resource Stewardship</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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</table>
Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Animal Science terminology within the agricultural industry.
   
   A. Common terms used in the livestock industry
      1. Mature – complete in natural growth or development
      2. Castrate – to remove the testes
      3. Offspring – children or young of a particular parent
      4. Agricultural product – the result of an agriculture process that is ready for consumption
      5. Refer to livestock animals based on their characteristics using the chart below

   
   Livestock Terminology Chart

<table>
<thead>
<tr>
<th>Mature Female</th>
<th>Cattle</th>
<th>Sheep</th>
<th>Swine</th>
<th>Goat</th>
<th>Poultry</th>
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<tr>
<td>Mature Female</td>
<td>Cow</td>
<td>Ewe</td>
<td>Sow</td>
<td>Doe</td>
<td>Hen</td>
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<tr>
<td>Young Female</td>
<td>Heifer</td>
<td>Ewe Lamb</td>
<td>Gilt</td>
<td>Doe Kid</td>
<td>Poult/Poul</td>
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<td>Mature Male</td>
<td>Bull</td>
<td>Ram</td>
<td>Boar</td>
<td>Buck</td>
<td>Rooster</td>
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<tr>
<td>Castrated Male</td>
<td>Steer</td>
<td>Wether</td>
<td>Barrow</td>
<td>Wether</td>
<td>Capon</td>
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<tr>
<td>Offspring/Young</td>
<td>Calf</td>
<td>Lamb</td>
<td>Piglet</td>
<td>Kid</td>
<td>Chick</td>
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<tr>
<td>Agricultural Products</td>
<td>Meat/Milk</td>
<td>Meat or Mutton/Wood</td>
<td>Pork</td>
<td>Chevon/Cabrito</td>
<td>Meat/Eggs</td>
</tr>
</tbody>
</table>

B. Terms used in the aquaculture industry
   1. Aquaculture – the raising and harvesting of fresh and saltwater plants and animals
   2. Aquaculture products
      a. Fish – an aquatic vertebra with fins
         i. Examples: salmon, catfish, and swordfish
      b. Crustacean – aquatic arthropods with modified appendages
         i. Examples: crawfish, shrimp, and lobsters
      c. Shellfish – an aquatic invertebrate with a shell
         i. Examples: oysters, clams, and mussels
Aquatic plants – a plant that grows partially or wholly in water
  i. Example: seaweed

II. Aquaculture Methods
  A. Capture – capturing wild or shellfish including commercial and sport fishing
  1. Culture – form of aquaculture that includes cultivation, propagation, and marketing
  B. Sources of Aquaculture Products
  1. Freshwater – water that contains no salt
  2. Saltwater – water containing salt
  3. Brackish water – area where freshwater and saltwater meet resulting in a mixture of the two

III. Methods of Livestock Reproduction
  A. Natural Breeding- to reproduce sexually under natural conditions
  1. Commonly used when livestock is hard to breed artificially, the most natural and widely used method of reproduction
     a. Advantages - low labor demands, natural, and relatively inexpensive
     b. Disadvantages - limits genetic material to livestock you have access to, difficult to make large genetic improvements without large investments
  B. Artificial Insemination – introduction of semen from a male into the sex organ of a female by other than natural means
     1. Commonly used in swine and cattle especially dairy production
     2. Advantages - no management of male since semen is purchased, allows for high priced genetics for a portion of the costs, producers can be trained to perform artificial insemination, less physical wear on both the male and female
     3. Disadvantages - more labor than natural breeding and requires specific equipment
  C. Embryo Transfer – a procedure in which an embryo (an animal in the earliest stages of its development in the egg) from one female is removed from that female and implanted into another female
     1. Commonly used when you want to produce a large number of offspring from one superior female
     2. Advantage - allowing more than natural number offspring in a short amount of time
     3. Disadvantages - this procedure requires a veterinarian to perform the procedure, labor intensive, and expensive.
  D. Cloning – to reproduce a genetic duplicate from genetic material of an organism
     1. Not widely used, but experimental
     2. Advantage – creates an identical copy of an animal
     3. Disadvantages – very expensive, very labor intensive, ethically questionable

IV. Niche animal production terms
  A. Niche – a place, employment, status or activity for which a person or thing is best fitted, or specialized market.
  B. Certified – USDA has officially evaluated a meat product for class, grade, or other quality characteristics
  C. Free Range – Allowed to range and forage with relative freedom
D. Natural – a product containing no artificial ingredients or added color and is only minimally processed.
E. Organic – food produced without employment of chemically formulated fertilizers, growth stimulants, antibiotics, or pesticides.
   1. Antibiotic – free
   2. Hormone - free

V. Swine Production Systems
   A. Indoor – Environmentally controlled buildings that house swine at similar stages of development
   B. Outdoor – Systems where swine have access to the outdoors and shelter buildings are not environmentally controlled
   C. Life Cycle of Swine
      1. Farrow – Pigs from birth until approximately three weeks old or 10-15 pounds
         a. Sows are placed in individual farrowing pens or stalls
         b. Protects the piglets, usually 9-10 pigs per litter, from getting crushed by the sow.
         c. Protects the piglets and workers from the sow’s protective nature
         d. Highest loss of piglets happens from birth until they are 3-4 days old.
            Several protective measures are taken to protect the young pigs:
            i. The navel is disinfected
            ii. Needle teeth are clipped so they do not injure other pigs or the sow
            iii. They receive a supplement of iron
            iv. Their tails are docked to prevent damage from getting stepped on
            v. Young males are castrated so they do not injure other pigs or workers
      2. Nursery – Pigs from approximately three weeks (10-15 pounds) until nine weeks old (40-60 pounds)
         a. Pigs are housed on slatted floors that lets waste fall through, keeping the pigs clean
         b. Pigs are fed as many as five different diets changed to meet the needs of the growing pig
      3. Grower – Finish – Pigs from approximately nine weeks old (40-60 pounds) until they are approximately 265-275 pounds
         a. Pigs are focused on growth and development
         b. Although types of housing vary, they are kept as clean and comfortable as possible to ensure high rates of gain
         c. Diets are adjusted to meet the needs of the specific needs of the pigs at stage of growth
      4. Market – Pigs weighing approximately 265 pounds
         a. Pigs are marketed to a terminal or live market

VI. Management Practices in Livestock Production
A. Castration – removing the testes to prevent unwanted breeding, leads to better meat, and results in less fighting and aggressive behavior among males
B. Dehorning - to remove or prevent the growth of horns to protect humans and other animals from being injured
C. Vaccination – administering microorganisms to increase immunity to a particular disease
D. Identification – method used to label livestock for the purpose of individual recognition
   1. Examples: ear tag, tattoo, ear notch, brands, electronic id, neck chains, nose prints
E. Docking – removal of a portion of the tai to prevent the anus from becoming dirty possibly resulting in disease
F. Teeth clipping – clipping the needle teeth of piglets to prevent injuries to other pigs
G. Debeaking – to remove the tip of the upper mandible to prevent cannibalism and fighting
H. Shearing – to cut or clip the hair or wool (the reason for shearing varies by species and breed)

VII. Production methods used for sheep and goats
A. Types of sheep/goats that are raised
   1. Purebred Flock – Mating of parents from a common genetic group or breed.
   2. Commercial Flock – Flocks that sell pounds of meat and/or wood instead of breeding stock.
B. Types of operations sheep/goats are raised on
   1. Farm Flock – Slightly smaller operations that are kept more confined in fenced pastures.
   2. Range Band – Raised on the range in herds of 1,000 or more

VIII. Types of Chicken production systems
A. Egg production systems – management of chickens for the sole purpose of egg production
   1. Egg – the hard-shelled reproductive body of a bird, most commonly a chicken
   2. Pullet – young female chicken used for egg production
   3. Steps:
      a. Pullets are fed a high-quality diet
      b. Eggs are collected
      c. Eggs are cleaned and graded
      d. Eggs are packaged
      e. Eggs are shipped to restaurants and grocery stores
B. Meat production systems – management of chickens for the sole purpose of meat production
   1. Broiler – a chicken raised for the purpose of meat production
   2. Broiler Breeder – young female chicken used for producing meat type off-spring
   3. Steps:
      a. Broiler breeder chickens are fed a high quality diet
      b. Eggs are collected from Broiler Breeders
      c. Eggs are incubated and hatched
      d. Chicks are fed a high quality ration and grown
      e. Full-grown broilers are harvested, cleaned, and graded.
      f. Meat is hipped to restaurants and grocery stores
IX. Beef Production Systems
A. Cow/Calf Production – an operation that focuses on calf production through weaning.
   1. Cattle graze in herds in large pastures.
   2. Calves are kept with their mothers.
   3. Most cow/calf operations are family owned
   4. Calves range in age from birth to approximately 6-12 months of age.
B. Backgrounding – Growing program for feeder cattle from time calves are weaned until they go to a feedlot.
   1. Calves of similar age and weight are kept together and graze on pasture.
   2. Calves begin to receive grain to supplement their diets.
   3. Most backgrounding operations are family owned.
   4. Calves come from the cow/calf operations and stay until they are approximately 12-18 months old
C. Feedlot – Enterprise in which cattle are fed grain and a balanced diet for 90=120 days. Feedlots range in size from less than 100-head capacity to many thousands.
   1. Cattle are kept in groups of approximately 100 head.
   2. Cattle are kept in large lots allowing at least 125 square feet per head
   3. They are fed a scientifically formulated ration and have constant access to water.
      The health of the livestock is carefully monitored, usually 1-2 times per day.
   4. Cattle are fed until they reach approximately 1,250 pounds

X. Dairy Production Systems
A. Hutch - an individual housing unit designed for young calves.
   1. Young calves are given colostrum, nutrient rich milk, immediately after birth.
B. Freestall barn – A facility to house dairy cows that provides the animals with a clean, dry, comfortable resting area and easy access to food and water. The cows are not restrained and are free to enter, lie down, rise, and leave the barn whenever they desire.
   2. Cows consume approximately 100 pounds of feed and 50 pounds of water each day.
C. Milking parlor – a specialized area on the dairy farm where the milking process is performed. Cows are brought into the parlor two or three times a day.
   1. On average a cow gives 6.5 gallons of milk each day
   2. It takes approximately 500 pounds of circulated blood to produce the milk.
D. Processing plant
   1. The milk is homogenized, reducing the size of fat globules to make the milk smooth.
   2. The milk is pasteurized, a heat treatment used to remove pathogens from the milk.
## Suggested Activities 5.01

<table>
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<tr>
<td>5.01.01</td>
<td>What Do You Call It? An Introduction to Livestock Terminology Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>5.01.02</td>
<td>A Fishing Trip into the Aquaculture Industry Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>5.01.03</td>
<td>Livestock Reproduction Methods Middle School Food and Agricultural Literacy Curriculum</td>
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<td>5.01.04</td>
<td>Niche Products, What Do They Really Mean? Middle School Food and Agricultural Literacy Curriculum</td>
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<td>5.01.05</td>
<td>How are Pigs Raised? Swine Production Systems Middle School Food and Agricultural Literacy Curriculum</td>
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<td>5.01.06</td>
<td>Livestock Management Practices Middle School Food and Agricultural Literacy Curriculum</td>
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<td>5.01.07</td>
<td>How are Sheep and Goats Raised? Sheep and Goat Production Systems Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>5.01.08</td>
<td>Where Do They Come From? The Chicken and the Egg Middle School Food and Agricultural Literacy Curriculum</td>
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<td>5.01.09</td>
<td>Egg Science: Standing on Raw Eggs, The Kitchen Pantry Scientist Students watch the video or teacher can choose to recreate the demonstration in class. <a href="http://kitchenpantryscientist.com/egg-science-standing-on-raw-eggs/">http://kitchenpantryscientist.com/egg-science-standing-on-raw-eggs/</a></td>
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<td>5.01.11</td>
<td>Where’s the Beef Come From? Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>5.01.12</td>
<td>Where Your Milk Comes from…Diary Production Systems Middle School Food and Agricultural Literacy Curriculum</td>
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</table>
I. Species Specific Byproducts  
   A. Animal Products  
      1. Byproducts – products of considerably less value than the major product (hide or pelt)  
      2. Edible – fit to be eaten by humans (tallow or lard)  
      3. Inedible – not edible; unfit to be eaten by humans (cosmetics)  
      4. Species – a class of animals having some common characteristics or qualities; distinct sort or kind (swine)  
   B. Specific byproducts from different species  
      1. Beef/Dairy – tripe, surgical sutures, and gelatin  
      2. Sheep – book bindings, bandage strips, and shampoo  
      3. Swine – ears, skin for skin grafts, and heart valves  
      4. Goat – handbags, clothing (sweaters,) and soap  
      5. Poultry – fertilizer, feather meal, and brushes  

II. Specialty Animal Production Systems  
   A. Specialty animal – animals raised within agricultural production other than the traditional agricultural animals (cattle, sheep, swine, goats, horses, and poultry)  
   B. Llama – used for protection of livestock and packing/pulling  
      1. Among the oldest domestic animals in the world  
      2. Modified ruminant with at here-compartment stomach  
      3. Spiting is their way of saying “bug off”  
      4. Have a communal dung pile  
      5. Larger than alpaca  
   C. Alpaca – used for fiber/hair  
      1. First imported to the United States in 1984  
      2. Produces one of the world’s finest and most luxurious natural fibers  
      3. Don’t have incisors, horns, hooves, or claws  
      4. Have a communal dung pile  
      5. Smaller than llama  
   D. Bison – used for meat  
      1. Raised in every state of the U.S.
2. Meat found in most natural food stores
3. Teetered on the brink of extinction little more than a century ago
4. At the turn of the last century, fewer than 1,000 bison remained in existence
5. Meat is low in fat, high in protein, and iron, and has a great cholesterol profile

E. Ostrich - for meat
1. Largest living bird in the world
2. Flightless bird
3. Only has two toes, other birds have three or four toes
4. Runs at speeds of up to 40 MPH for sustained times
5. Lives to be 50-75 years old

F. Emu –used for meat
1. Native to Australia
2. Commercial emu farming in the U.S. did not begin until late 1980s
3. Three forward pointing toes
4. Low fat meat has less sodium than beef, chicken, or turkey
5. Egg shells are used for decorative purposes

III. Animal Agricultural Myths
A. Myth – A fiction or half-truth, especially on that forms part of an ideology
B. Myths to be addressed
1. Cloning results in severely damaged animals that suffer and continue to have health problems all their lives
2. Meat from cloned animals is already in the food supply.
3. A vegetarian diet is healthier than a diet that includes meat, milk and eggs
4. Farm animals in confinement are prone to disease, forcing farmers to routinely use antibiotics, hormones, and drugs to keep them alive. This jeopardizes animal and human health
5. Farmers care less for their animals than they do for the money animals bring them. Agribusiness corporations mislead farmers into using production systems and drugs that mean profits at the cost of animal welfare.
6. Farm animals are routinely mutilated by beak trimming, tail docking, branding, dehorning, castration, and other practices to make it easier for the farmer.
7. Bovine spongiform encephalopathy (mad cow disease) infected tissue can be found in human food supply.
8. Coming in contact with any live poultry will give you avian influenza (bird flu)
9. You can get the Novel H1N1 virus (swine flu) from pork or pork products.

IV. Who is Watching Out for Us?
A. Bias – a personal judgement, introducing error into asampling or test ot encourage one outcome or answer over others.
B. Credible – capable of being believed; plausible’ worthy of confidence; reliable
C. Determining if a resource is credible
   1. Publication date
   2. Author(s)
   3. Funding Source
   4. Type of resource

D. Agencies focusing on consumer awareness in the animal agriculture industry
   1. National Pork Board
      a. Current information on issues impacting the pork industry – [www.pork.org](http://www.pork.org)
      b. Food safety and animal care in pork production – [www.theotherwhitemeat.com](http://www.theotherwhitemeat.com)
      a. Food safety bill updates
      b. National Animal Identification System (NAIS) updates
      a. Grilling tips for beef
      b. Beef nutritional facts
      a. Nutritional information for dairy products
      b. Dairy product updates for health professionals
      a. Statistics and markets about sheep
      b. Directory of sheep breeds
      a. Goat judging courses
      b. Grant opportunities to raise goats
      a. Goat milk recipes
      b. How to read goat pedigrees
      a. Updates on avian influenza (bird flu)
      b. Proper storage of eggs and poultry products
### Course: Exploring Agricultural Science

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<th>Objective</th>
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<td>5.02 3%</td>
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<td>Understand the fundamentals of the animal science industry</td>
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<td></td>
<td>5.02</td>
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<td>Understand the importance of animal product uses and consumer product awareness</td>
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**Activity Contributors:**
Middle School Food and Agricultural Literacy Curriculum
[https://www.ffa.org/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum](https://www.ffa.org/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum)

**Suggested Activities 5.02**

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<td>5.02.04</td>
<td><em>Who is Watching Out for Us?</em></td>
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Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA

**Note to teacher:** Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Care and handling of livestock
   A. Common handling and transportation practices
      1. Limit amount of stress on animals
      2. Awareness of space, temperature, loading/unloading, and truck/trailer when working with animals
   B. Common animal practices
      1. Preventative measures: intended or used to prevent or hinder; acting as an obstacle; noting a drug or vaccine preventing disease
      2. Treatment measures: the method of dealing with a given situation; management in the application of medicines, surgery, and practices.

II. Relationships between humans and animals
   A. Interdependence – mutually dependent; depending on each other
   B. Examples of interdependence that can exist between humans and animals
      1. Domestic animals dependent upon humans
         a. Provide shelter
         b. Provide food and water
         c. Provide security and safety
         d. Provide medical attention
         e. Respect ecosystems and nature
         f. Engage in sound environmental practices
      2. Human lives enhanced by animals
         a. Provide food
         b. Provide fiber and clothing
         c. Provide numerous byproducts
         d. Medical advancements
         e. Provide transportation/work (cowboys/mounted police/bomb and drug dogs)
         f. Assistance with health issues (sight dogs)

III. Dangers involved in working with animals
   A. Being around animals
1. Demonstrate calmness
2. Refrain from being loud

B. Approaching animals
   1. How to approach
      a. Vision
      b. Flight zone – an animal’s personal space
   2. When not to approach
      a. Imitated or aggressive
      b. Presence of offspring

C. Handling and moving animals
   1. Herding – gather, keep, or drive a group of animals
   2. Point of Balance – an area near the shoulder of an animal that keeps the
      animal moving forward

IV. Animal welfare vs Animal Rights
   A. Ethics – rules or standards governing the conduct of a person or group
   B. Animal welfare – a belief that animals should receive proper care such as food,
      water, and medical attention
   C. Animal rights – a belief that animals have rights which are equal to humans
   D. Ethical practices in animal production
      1. Provide adequate food and water
      2. Provide safe and humane facilities
      3. Provide appropriate health and medical attention
      4. Provide accurate animal records
      5. Provide appropriate methods of euthanasia (practice of painlessly ending
         the life of an animal that has a terminal illness or incurable condition, as
         by giving a lethal drug)
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Activity Contributors:  
Middle School Food and Agricultural Literacy Curriculum  
[https://wwwffaorg/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum](https://wwwffaorg/resources/educators/class/middle-school-food-and-agricultural-literacy-curriculum)

### Suggested Activities 5.03

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| 5.03.01 | Care and Handling  
Middle School Food and Agricultural Literacy Curriculum |
| 5.03.02 | We Are All in This Together  
Middle School Food and Agricultural Literacy Curriculum |
| 5.03.03 | Proceed with Caution  
Middle School Food and Agricultural Literacy Curriculum |
| 5.03.04 | Welcome to Ethics Court  
Middle School Food and Agricultural Literacy Curriculum |
I. Plant parts and their functions
   A. Roots
      1. Location: Roots usually are located at the bottom of the plant, or the part of the plant that has contact with the soil or other medium (water in the case of hydroponics.)
      2. Functions:
         a. Absorb water and nutrients from soil
         b. Anchor the plant to the ground
         c. Support the stem structure
         d. Store food (energy) for the plant
   B. Stems
      1. Locations: Stems are usually the central structure of the plant to which flowers, leaves, and roots are all attached.
      2. Functions
         a. Channel for the transportation of water, minerals, and sugar from the roots and leaves to the rest of the plant
         b. Support buds and leaves
   C. Leaves
      1. Location: Leaves are generally connected to the stem by leaf petioles but are arranged on the stem in various patterns depending on the plant.
      2. Functions:
         a. The site of photosynthesis (energy factory for the plant)
         b. Provide a large surface area to increase the absorption of sunlight that is essential to photosynthesis
         c. Also the major site of plant transpiration (the diffusion of water, carbon dioxide, and oxygen to and from the plant)
   D. Flowers
      1. Location: Flowers are usually the most flashy part of the plant
      2. Functions
         a. Primary function is reproduction
         b. Color and fragrances have evolved to attract pollinators
         c. Can contain male (stamen) and/or female parts (pistil)
   E. Fruit
1. Location: Fruits are formed from the fertilized ovule (seeds) and the ovary walls of the female part of the flower.

2. Function:
   a. Protect the seed
   b. Assist in the dispersal of seeds (by attracting animals that may consume the fruit and disperse the seed)

F. Seeds
1. Location: Seeds are the mature ovule which is originally found in the female part of the flower and are usually housed in a type of fruit or cone.

2. Functions:
   a. Contain the embryo which will germinate and become a new plant
   b. Usually protected by a seed coat to protect from moisture and extreme conditions
   c. Contain endosperm which is a built-in food supply for the embryo during germination

II. Basic Plant Requirements
A. Photosynthesis
   1. The process by which plants make their energy (food)
   2. Most photosynthesis occurs in the leaves of the plant because they have the greatest surface area to collect the most light.
   3. Photosynthesis occurs when light, carbon dioxide, and water are converted into energy for the plant.

B. Light
   1. Light is required for photosynthesis
   2. Light is the energy that powers the photosynthetic process
   3. Light can be either natural or artificial
      a. Natural Light: light from the sun. The sun is the most important energy source in the world as all of our food products (even meat and eggs) ultimately rely on the sun’s energy. Ex: Steaks come from cows, who eat plant matter, which was grown using the sun’s energy.
      b. Artificial Light: Plants can also use artificial light for the process of photosynthesis. Artificial light is light from bulbs and other man-made sources. Artificial light can be used to manipulate plants to flower, fruit, or germinate at specific times.

C. Air
   1. Plants must have plenty of air to perform photosynthesis and to live.
   2. During photosynthesis, plants absorb carbon dioxide and release oxygen.
   3. Plants are necessary to our survival and the health of the earth because they convert harmful carbon dioxide into the oxygen we breathe.

D. Water
   1. All living organisms, including plants, require water to live.
   2. Water is essential for the process of photosynthesis.
   3. Also, plants use water to transport minerals and nutrients from the roots to the rest of the plants and the energy created by photosynthesis from the leaves back down to the roots.
E. Growing Media
1. Plants require a medium to anchor the plant and provide minerals.
2. Soil:
   a. Plants are most commonly grown in soil.
   b. Plants anchor themselves in the soil using their roots.
   c. Soil provides water and nutrients for the plants.
3. Soilless Media:
   a. In greenhouses, plants are commonly grown in soilless medium.
   b. Soilless medium may contain moss, perlite, vermiculite, sand, and bark.
   c. Soilless media is effective because it is sterile.
4. Hydroponics:
   a. Hydroponics is the practice of growing plants in the absence of soil, using just water.
   b. In large greenhouse operations, hydroponics reduce the amount of water needed and wasted by ensuring that all of the water reaches the roots.

III. Edible plant parts
A. Plants are the most important source of food in the world (both for humans and animals.) The fruits, vegetables, and starches we enjoy each day come from different parts of the plants. These foods are all one of the six main plant parts: roots, stems, leaves, flower, seeds, and fruits. Edible plant parts are classified as either vegetables or fruits.
B. Vegetables: Vegetables are any edible part of the plant that is not the fruit. This includes foods that are leaves, roots, stems, flowers, and seeds.
1. Roots: Roots are used to collect water and minerals from the soil. Roots are also used for energy and food storage from some plants. Examples of edible roots include carrots, beets, turnips, and rutabaga.
2. Stems: Stems transport water and minerals from the roots to the rest of the plant and transports the energy created by photosynthesis from the roots to the rest of the plant. Commonly eaten stem parts include celery, onions, and potatoes. Potatoes are actually modified stems that plants use to store energy which is why they are such a great source of energy.
3. Leaves: Leaves are the primary site of photosynthesis in plants. They are also the site of transpiration. Leaves are a great source of many vitamins needed for healthy humans and animals. Commonly consumed leaf foods include lettuce, kale, spinach, cabbage, collards, and mustard greens.
4. Flower: Flowers are the reproductive structure in plants and can contain male (stamen) and/or female (pistil) structures. Flowers are usually the flashiest part of the plant in order to attract pollinators. Interestingly, many flowers are common foods for humans including broccoli and cauliflower.
5. Seeds: A seed is the mature ovule which is originally found in the female part of the flower and is usually housed in a type of fruit or cone. Seeds contain the embryo which will germinate and become a new plant. Common edible seeds include lima beans, peas, sunflower seeds, green beans, and pinto beans.
C. Fruit – Technically, fruits that we consume (apples and oranges, for example) are the fruiting body of the plant. Believe it or not, ketchup is a fruit product because it is derived from the fruit of a tomato plant.

1. Fruits are formed from the fertilized ovule (seeds) and the ovary walls of the female part of the flower. The fruit protects the seed and assists in the dispersal of seeds by attracting animals that may consume the fruit and disperse the seed. Edible fruits include apples, oranges, and strawberries. Although they are often called vegetables, tomatoes and cucumbers are also the fruit of the plant.
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**OBJECTIVE:**
Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA
National Agriculture in the Classroom; agclassroom.org

**Suggested Activities 6.01**

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<td>The Functions of a Plant Middle School Food and Agricultural Literacy Curriculum</td>
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<td>6.01.02</td>
<td>Plant Needs Middle School Food and Agricultural Literacy Curriculum</td>
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<td>6.01.03</td>
<td>Salad Investigation Middle School Food and Agricultural Literacy Curriculum</td>
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<td>6.01.04</td>
<td>Can We Have Too Much of a Good Thing? National Agriculture in the Classroom; Agclassroom.org</td>
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<td>6.01.05</td>
<td>Digging Into Nutrients National Agriculture in the Classroom; Agclassroom.org</td>
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<td>6.01.06</td>
<td>Flower Power National Agriculture in the Classroom; Agclassroom.org</td>
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<td>6.01.07</td>
<td>It’s a Dirty Job National Agriculture in the Classroom; Agclassroom.org</td>
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<td>6.01.08</td>
<td>Plant Propagation National Agriculture in the Classroom; Agclassroom.org</td>
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<tr>
<td>6.01.09</td>
<td>Plants Parts and Functions National Agriculture in the Classroom; Agclassroom.org</td>
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I. Plant uses and by products
   A. Human food products:
      1. The most common plant products are those that are found in the grocery store
         and supermarkets. Foods such as tomatoes, lettuce, corn, lima beans, and other
         common fruits and vegetables are all plant products. Vegetables are any edible
         part of the plant that is not the fruit. This includes foods that are leaves, roots,
         stems, flowers and seeds.
      2. Fruits that we consume (apples and oranges, for examples) are the fruiting
         body of the plant. Fruits are formed from the fertilized ovule (seeds) and the
         ovary walls of the female part of the flower. The fruit protects the seed and
         assists in the dispersal of seeds (by attracting animals that may consume the
         fruit and disperse the seed).
   B. Animal food products:
      1. Plants are also commonly used to feed animals. Both companion (dogs, cats,
         and guinea pigs, for example) and livestock animals (dairy cows, beef cattle,
         swine and poultry, for example) are often fed feed that contains corn,
         vegetable oil, cotton seed, hay and other forages and grains.
         a. Nonfood plant products:
            1. While plants are most commonly used for either plant or animal food,
               there are many products of plants that are used every day. There are
               many household items that are derived from plants including:
               shampoos, fragrances, adhesives, art supplies, chemicals,
               pharmaceuticals, furniture, and building supplies. Many of these are
               byproducts of edible plant products and crops.
            2. A byproduct is a secondary product created during the creation of the
               primary product. Byproducts are usually created unintentionally.
   II. Understanding plant product labeling
      A. Fruits and vegetables are often labeled with colorful, eye-catching, and
         informative labels that tell the consumer more about where, when and how the
         produce was grown. However, these labels can sometimes be misleading. It is
important that consumers understand the meaning of plant product labels and can recognize misleading labels.

III. Organic labels
A. Organic produce are fruits and vegetables grown in a way that reduces the negative impact plant production can sometimes have on the environment.
   1. For the most part, certified organic food is grown in the absence of synthetic fertilizers, pesticides, growth hormones, or bioengineered seeds.
   2. Before a food can be labeled with the official USDA organic seal, facilities and farms where the food is grown, transported, stored and processed are inspected and must meet rigid national standards set forth by the United State Department of Agriculture (the government organization that regulates and monitors agriculture, food and nutrition in the United States.)
B. Benefits of organic production
   1. Organic farming is built on the principle of reducing strain on the soil, water sources, and the environment.
   2. Often producers and marketers claim that organic food is healthy and tastes better. To date, there is not any definite scientific research to support the claim that eating organic produce rather than conventionally grown produce has any health benefits for humans. And since taste is an individual perception, it is hard to say whether or not organically grown fruits and vegetables taste better.

IV. Locally grown labels
A. Because the transportation of agricultural goods across the world and country is both expensive and costly for the environment, many producers are marketing their fresh produce as “locally grown.”
B. However, these labels may be tricky because regulations on locally grown labels are not clear in most circumstances. In some situations, the locally grown label may only mean that the produce was grown in the geographic region of the United States, which may consist of several states.
   1. Some states such as Georgia have implemented a locally grown marketing plan of their own. The Georgia Grown label means the produce was grown in the state of Georgia.
C. Buying locally grown produce reduces the amount of fossil fuels needed for transportation, mitigates the environmental impact of transportation, and supports the local economy and farmers.
D. Many consumers claim that locally grown food is fresher, and therefore taste better than foods imported from far away.

V. COOL: Country of Origin Labeling
A. Recently, the United States Department of Agriculture implemented a plant to mandate country of origin labels on all muscle meats, fish, and seafood, perishable fruits, and vegetables, and certain nuts. These mandatory labels notify consumers of the country of origin (country in which the animals were raised or the plants grown) of these foods. This law became completely effective in March 2009.

VI. Other plant produce labels
A. Produce, grocery shelves, and food packaging are all designed to catch the consumer’s eye and compel them to purchase a product. Labels may appeal to a
consumer’s desire for environmentally friendly food, food that supports the local economy, fresh and tasty produce, or simply the most cost effective product choice. A few additional common plant produce labels include:

1. Pesticide-free – Produce labeled pesticide free should have been grown in the absence of synthetic pesticides. However, these labels are not regulated by the USDA or other regulating agencies and may be misleading.

2. Vine Ripened – In most cases, fruits and vegetables are harvested before they ripen to reduce spoilage and allow time for transportation and storage. Producers then induce ripening using chemical simulations such as ethylene. However, many plant products are labeled as “vine ripened” meaning they were ripened on the vine. These products are often more costly but may yield a fresher and tastier product.

3. In addition, to these labels, producers may also place labels that describe the produce in further detail (for example; the label on an apple may tell you that it is a Granny Smith apple, or the bananas you buy may advertise that they are the popular Chiquita brand.) These labels can be very informative as well as eye catching to the consumers.

VII. Fiber-based products are items such as paper, cloth, rope and twine.

A. Synthetic Fibers: Synthetic fibers are produced in factories and are composed of chemical compounds that mimic the characteristics of natural fibers created from plants and animals. These include fabrics such as spandex, rayon, nylon, acetate, polyester.

B. Natural Fibers: Natural fibers are those fibers that are produced by plants or animals and harvested for human use as clothing and shelter.

1. Plant Fiber-based product
   a. Cotton: cotton is the world’s most popular natural fiber and one of the United States’ largest cash crops.
      i. Cotton is used commonly for t-shirts, denim, towels, and linens. The United States grows more cotton than any other country besides China.
      ii. Cotton is grown in large fields in rows. Seeds are planted using mechanical planters. About six weeks after being planted, the cotton bush blooms; three weeks later the cotton boll forms, and finally, 16 weeks into the season, the boll bursts into the lint (cotton balls.)

   b. Wood-based Fiber products: Trees are an excellent source of fiber in the world. Many things in our everyday lives, such as cardboard, papers, and building supplies are all tree products. The practice of planting and managing trees is called forestry.

   c. Natural twine and rope: Rope and twine are pieces of fiber that are twisted, wrapped, and knotted together to increase their strength. Rope and twine are commonly constructed from products derived from cotton, hemp, and other plant-based products.

2. Animal Fiber-based products: Throughout history, humans have relied on animal products for clothing and shelter. Animal-based fibers are still very popular and are often seen as luxurious fibers.
a. Leather and fur: leather and fur are the oldest form of natural fibers in human history. Leather is the skin of animals and fur is the hair of animals.
   i. Common sources of leather and fur are cattle, swine, fox, rabbits, otters, beavers, and coyotes.
   ii. To produce leather, the hair and flesh is completely scraped from the skin and the hide is cured with chemicals to keep it soft and flexible and to prevent it from rotting.
   iii. Leather is common in sports balls, clothing such as jackets and pants, and in novelty items such as cowboy hats. Furs are processed while still attached to the leather and are commonly used for their warmth for jackets, coats, scarves, and accessories.

b. Silk: Silk is produced by the worm of a particular moth, the Bombyx mori moth. This blind and flightless moth lays about 500 eggs that hatch into silk worms. Then, the worms eat every 30 minutes for about four weeks until they finally spin a silk cocoon.
   i. The highest priced silk comes from worms that are fed a strict diet of mulberry leaves.
   ii. It takes more than 2,000 worms to produce one pound of silk.

c. Wool: Wool is harvested mainly from sheep but may also come from goats, llamas, and alpacas.
   i. Wool is known for its warmth and texture.
   ii. Unlike furs and leather, wool can be harvested while the sheep are living. Usually, sheep are sheared (shearing is the process of removing the wool from the sheep with clippers, like shaving a human’s head) once or twice a year.
   iii. Wool is commonly used in coats, jackets, and accessories such as purses and handbags.

VIII. Plant product pathway - the path an agricultural commodity takes from the time it is planted in the field, harvested, processed, shipped, stored, and marketed.
   A. Production Agriculture – the field of agriculture that involves the planting and harvesting of raw agricultural commodities such as row crops, animals, and greenhouse plants. Plant crops such as apples and oranges are grown on large orchards in rows of trees.
      1. Other plant products such as cotton, peanuts, strawberries, potatoes, corn, wheat, and soybeans are grown in large fields in rows.
      2. Several plant products (such as tomatoes, strawberries, and ornamental plants) are commonly grown in sterile greenhouse environments. Each plant product is planted and harvested in a different way. Some plants may be planted from seeds, while others will be planted from young plants, called cuttings that have been grown in a lab. Plants also differ in the amount of time it takes the plant to produce mature food.
         a. Example – From the time corn is planted it takes only two or three months to have delicious corn on the cob. However, planting pecan or apple trees is a long-term investment as it may take from three to eight years to
produce marketable products. Once the plants reach maturity, the fruits, nuts and vegetables are harvested in different ways.

b. Some fruits, such as apples, are commonly picked by hand while cotton and peanuts are harvested using large machinery.

B. Plant Product Processing
1. Rarely does food ever travel directly from the farm to your plate. Food, especially plant products, goes through intense processing to create the ideal product for the consumer.
2. Example: Food that is canned or frozen must first go through a process of boiling, pressurization, pasteurization, or even radiation before being placed in an airtight container with chemical preservatives such as salt.
3. Often fresh fruits and vegetables are used to make processed foods such as jellies, peanut butter, baby foods, and juices. And plant products are processed even further and added to make foods such as frozen pies, dried products, pastries, cereals, and candies.

C. Transportation
1. Transporting raw plant products to processing plants and then finished products to the supermarket is an important and often overlooked part of any plant product pathway.
2. Food is commonly transported using tractor trailers, railroad cars, ships and even airplanes. It is very important that fruits and vegetables maintain their freshness and visual appeal while being transported. Therefore, cargo containers and trailers are often suited with climate control equipment and refrigerators to control temperature, humidity, and ethylene gases (gases released by plants as they ripen that will hasten the ripening and rotting of other fruits that come in contact with the gas.)
3. Because of America’s strong and extensive infrastructure of roads, airports, and railroads, we are able to enjoy fruits and vegetables from all over the world at all times of the year.

D. Marketing
1. Marketing includes packaging, distributing, advertising, and selling agricultural products. Packaging for plant products such as fruits and vegetables is chosen with two main concerns: product freshness and customer appeal.
2. Marketers use several methods to advertise their products including radio ads, television commercials, billboards, magazines, product coupons, free trials, and posters displayed at supermarkets. To market their products, marketers first determine what the customer values such as cost, health, taste, and appearance. Even the way products are placed on the shelves or arranged in the produce bins is meant to encourage passing customers to stop and purchase.
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<td><strong>Exploring Plants: They are More than Just Food!</strong></td>
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<td><strong>Reading Plant Produce Labels</strong></td>
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<td><strong>Fibers and Agriculture</strong></td>
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<td>6.02.04</td>
<td><strong>From Farm to Fork: Plant Product Pathways</strong></td>
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<td>National Agriculture in the Classroom; <a href="http://www.agclassroom.org">www.agclassroom.org</a></td>
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<td><strong>Cruisin’ for a Bruisin’ Food Packaging Specialist</strong></td>
<td>National Agriculture in the Classroom; <a href="http://www.agclassroom.org">www.agclassroom.org</a></td>
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<td>Understand agribusiness, government, and the consumer role in providing safe agricultural products for consumption</td>
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Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA
Top Vegetables Grown in North Carolina, Matt Shipman, NCSU, 2018
Local Harvest – www.localharvest.org

**Note to teacher:** Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Animal food product pathway
   A. Animal food products - animal food products come from beef, pork, poultry and dairy.
      1. Beef products come from beef cattle and products include hamburger, steak, and roasts.
      2. Pork products come from pigs and include ham, pork chops, bacon, and sausage.
      3. Poultry products come from any domestic bird raised for food, and the most common include chicken and turkey. Poultry also produces eggs.
      4. Dairy products come from dairy cattle and include milk, ice cream, yogurt, and cheese.
   B. Production - the type of operation or process involved in manufacturing animal food products
      1. Farm - land used to raise animals or grow crops
      2. Ranch - large area of grass or pasture land where animals freely roam and graze
      3. The production process includes animal selection, breeding and slaughter.
      4. Handling of unprocessed products, like raw milk
   C. Processing - the process of converting the original, raw product into a final product ready for distribution and consumption.
      1. Prepared processed foods like deli meat, cheese slices, yogurt, hot dogs, etc.
      2. Grading - sorting the product based on quality, like Prime beef, Grade A milk or Grade AA eggs
      3. Cleaning - removes unwanted materials from the food products, for example washing eggs
      4. Preserving - prevents the food from spoiling before it reaches the consumer and extends its shelf life
      5. Portioning - dividing the food products into serving sizes and packaging amounts
      6. Packaging - storing the food products in containers, like egg cartons, milk jugs, etc.
D. Distribution - preparing the animal food products to be sold
   1. Packaging - types of containers to keep food safe during transportation
   2. Storage requirements - the way the particular food product must be stored to stay fresh
   3. Shelf-life - the amount of time a food product can remain on the shelf without spoiling
E. Marketing - selling of animal food products to the consumer; connecting the consumer to the product
   1. Retail - the selling of products directly to consumers, such as grocery store chains
   2. Wholesale - buying or selling in large quantities for resale
   3. Restaurants - sell prepared foods to consumers

II. Edible plant food product pathway.
A. Edible plant food products - edible plant food products come from fruits, vegetables, herbs, and other edible plants.
   1. Fruit - edible, ripened ovary of a tree, shrub, or vine – apples, peaches, or grapes
   2. Vegetable - herbaceous plant that has edible parts – lettuce, spinach, cabbage, etc.
   3. Crop - a plant grown for its products which can be both edible and non-edible wheat or soybeans
      a. Cabbage: NC ranks 9th nationally
      b. Squash and Watermelon: NC ranks 8th nationally
      c. Cantaloupe and Tomatoes: NC ranks 7th nationally
      d. Cucumbers: NC ranks 5th nationally
      e. Pumpkins: NC ranks 4th nationally
      f. Sweet potatoes: NC ranks 1st nationally
B. Production - the type of operation or process involved in manufacturing edible plant food products
   1. Farm - land used to raise animals or grow crops
   2. Orchard - specifically, for the production of fruit or nut trees
   3. The production process includes the selection of plant varieties, cultivation, pest and weed control, growing seasons, and harvest
   4. Handling of unprocessed products, such as freshly picked apples.
C. Processing - the process of converting the original, raw product into a final product ready for distribution and consumption.
   1. Prepared processed foods like applesauce, frozen or canned fruits, and vegetables, and dried fruits
   2. Cleaning - removes unwanted materials from the food products, like soil or residue.
   3. Preserving - prevents the food from spoiling before it reaches the consumer; for example, coating fruits and vegetables like cucumbers with wax.
   4. Portioning - dividing the food products into serving sizes and packaging amounts; for example, a bag of grapes or cherries, or a container of blueberries
5. Packaging - storing the food products in containers; for example, plastic cartons for cherry tomatoes

D. Distribution preparing the edible plant food products to be sold
   1. Packaging - types of containers to keep food safe during transportation.
   2. Storage requirements – the way the particular food product must be stored to stay fresh, such as temperature – controlled storage of apples
   3. Shelf-life - the amount of time a food product can remain on the shelf without spoiling

E. Marketing - selling of edible plant food products to the consumer; connecting the consumer to product
   1. Retail - the selling of products directly to consumers, such as grocery store chains
   2. Wholesale - enterprise that includes buying or selling products to retailer or other wholesalers in large quantities
   3. Restaurants - selling prepared foods to consumers

III. History of food and the evolution or agriculture and transportation
A. Hunters and gatherers - traveled to find food by hunting and gathering any edible plants and animals they could find.
   1. Before the discovery of agriculture and transportation, survival was based on hunting and gathering.
   2. Families constantly traveled, often by foot or using animals like horses, to find new food when the food supply in their current home diminished.
   3. Hunters and gatherers lived in a time before the development of transportation or shopping. They had to find food rather than have food brought to them.

B. The global change of society and agriculture: people learned how to farm and transportation evolved.
   1. Once people learned how to farm, they were able to produce enough food to spread and share across the land, and this allowed people to settle in one location rather than having to move to find food.
   2. Civilization - a developed society.
   3. As civilizations began to take over the land, there was a higher demand for transporting food.

C. Agriculture in the local community in today’s society
   1. Farmer’s markets - a local market where farmers come together and sell produce and other products to the local community. Brings the farm to the consumer
   2. Community Supported Agriculture (CSA) - A farmer offers a certain number of “shares” to the public. Typically, the share consists of a box of vegetables, but other farm products may be included such as fresh flowers, honey, etc. Interested consumers purchase a share (much like a membership or a subscription) and in return receive a box (bag, basket) of season produce each week throughout the farming season.
   3. Roadside Stands - a temporary or semi-temporary structure that allows farmers to sell directly to consumers. They can be located on or off the farm, preferably in close proximity to a high traffic area.
D. Current modes of transportation for food
1. First form of transportation: animals like horses and mules to carry items, horse, and carriage/wagons, and boats/ships
2. Boats/ships - carry large, heavy cargo across the oceans
3. Trains - fast and efficient for transporting food items and are widely used today. They can also be used to transport live animals to different locations
4. Trucks - most common automobile used to transport food, and are often in the form of tractor trailers or tankers, like the milk truck
5. Airplane - made it possible for food to be quickly transported all over the world
6. Trains, trucks, planes, and boats are all temperature controlled to ensure that the food stays fresh while it is being transported.

IV. Importance of public perception in terms of correlation between consumer concerns for food safety and producer marketing concerns
A. People form perceptions based on information provided by many sources, some of which provide accurate information, and others that are not always honest and accurate.
1. Newspaper, radio, television news reports and talk shows, magazines, internet are all sources of information
2. Media - one of the most common ways information is transferred to the public, often through the form of news.
3. Public perceptions of food safety drive agricultural food product production.
B. Product preferences of consumers are based upon positive or negative experiences with products, or based upon information received from the news or other resources.
1. Consumer - a person who buys or uses a good or service
2. Consumers make their decisions to purchase a product based on news reports., advertisements, food package labels, how safe they feel using the product and the opinions of other consumers.
3. Consumers drive the production and sale or distribution of agricultural food products.
4. If a product is popular and sales are high, the producer will produce more of that product.
5. If sales are low, the producer will produce less or stop producing the product all together.
C. Producers promote food safety through systems like: Animal Disease Traceability and Country of Origin Labeling (COOL)
1. Food Safety - the process of assuring that food will promote good health.
2. Animal Disease Traceability - livestock tracking system to protect the health of livestock and track/prevent diseases.
3. COOL - a way for retailers to notify consumers of the location in which their food originated.
4. Consumers should be aware of these practices to understand the precautions agriculturalists take to keep food safe.
D. Reliable Resources - sources of information that meet the criteria of being accurate, trustworthy, and reputable.
   1. Resources are reliable when: the information is accurate, the author is reputable, references are included indicating where the information came from, the information is based on facts rather than opinions, and the information is current.

V. Safety responsibilities in the food supply continuum
   A. Food Sanitation - the process of keeping the areas where food is processed and prepared clean.
   B. Good Agricultural Practices (GAP’s) - environmental and operational conditions necessary for the production of safe, wholesome fruits, vegetables, and livestock
      1. Specific guidelines for fruit, vegetable, and livestock producers to follow to ensure safe products.
      2. To ensure a safe food supply, producers are responsible for minimizing risks caused by potentially threatening sources that are a part of the production process: soil, manure, cooling units, ice transport vehicles, poor employee hygiene
      3. GAP’s include practices like good hygiene of employees, clean storage facilities, water quality monitoring, record keeping for the farm operations, harvest and storage sanitation, safe handling or manure, following all on-farm safety practices and procedures, etc.
   C. Similar to GAP’s - Good Manufacturing Practices (GMP’s): established quality systems for manufacturers to ensure that their products meet specific requirements to ensure safe products.
      1. GMPS’s is a government-regulated program
      2. Record-keeping, documentation, training, evaluation, and inspections help ensure that GAP’s and GMP’S are being implemented by businesses/operations.
   D. Hazard Analysis and Critical Control Points (HACCP) - identifies points in food handling where contamination is likely to occur.
      1. HACCP provides steps to take to manage and reduce the contamination of food, and applies to facilities and processes, like the process of packaging meat or a facility where ice cream is made.
      2. Larger processors are more likely to have a HACCP plan than small processors.
      3. HACCP is a government-regulated program.
      4. HACCP aims to prevent potential microbiological, chemical, and physical hazards in foods.

VI. Government agencies involved in regulating the food supply
   A. United States Department of Agriculture (USDA)
      1. Abraham Lincoln founded the USDA in 1862
      2. Main organization that houses many smaller agencies responsible for the sectors of food, agriculture, and natural resources.
      3. FSIS is an example of a service branch of the USDA
      4. Sets quality industry standards for products like beef, poultry, eggs, dairy, and many others
B. Food and drug Administration (FDA)
   1. once a part of the USDA and now a part of the Department of Health and Human Services, was established in 1927
   2. Responsible for protecting public health by ensuring the safety, efficiency, and security of human veterinary drugs, biological products, medical devices, our nation’s food supply, cosmetics and products that emit radiation.

C. Food Safety and Inspection Service (FSIS)
   1. Promotes public healthy by protecting against food-borne illness and ensuring that meat, poultry, and egg products are safe, wholesome, and correctly packaged.
   2. Responsible for the development of HACCP
   3. Monitors recalls of meat and poultry products
   4. Researches food safety hazards and issues

D. Environmental Protection Agency (EPA)
   1. Established in 1970
   2. Works to promote a clean, healthy environment
   3. Writes the regulations for the laws set by Congress, educates the public on environmental issues, and researches environmental issues
   4. Regulates pesticides and chemicals used on the food supply

VII. Difference between human health issues and animal health issues
A. Human health issues – health issues affecting only humans
   1. Cannot be spread from humans to animals
   2. cannot be caught by humans from animals
   3. Human health issues can be contagious among humans, or not contagious, like the common cold or cancer
   4. Contagious – spreads easily through contact
   5. Other human health issues can come from food, yet are not animal related. For example, improper storage or handling of food can result in food-borne illness or food poisoning, like eating egg salad after it has been sitting on the counter for three hours.

B. Animal health issues – health issues affecting only animals
   1. Cannot be spread from animals to humans
   2. Cannot be caught by animals from humans
   3. Animal health issues can be contagious among animals within the same species, or contagious among animals of varying species, like Salmonella in horses or E. coli in farm animals
   4. Animal health issues can also be unique to the animal, therefore not contagious among humans or animals, like colic in horses

C. Zoonotic health issues – health issues affecting both humans and animals
   1. Diseases that can be transferred from animals to humans or from humans to animals, like Salmonella, rabies, H2N2, or E. coli
   2. Zoonotic diseases can spread through direct contact with the infected animal or by consuming a contaminated animal product.
   3. E.coli is an example of a zoonotic human animal health issue that can be transferred both by consuming contaminated meat and by coming in contact with an infected live animal.
4. H1N1 is an example of a zoonotic human animal health issue that can only be transferred by coming in contact with an infected animal, not by consuming animal products.
5. Other health issues like West Nile Virus, carried and spread by infected mosquitoes, can be harmful to both humans and animals.
D. The United States Department of Agriculture and Center for Disease Control (CDC) helps monitor, regulate, research, and prevent human-animal health issues.
1. USDA Animal and Plant Health Inspection Service (APHIS): sets regulations and plans to help protect and promote the safety of agricultural animals and reduce health risks.
2. CDC National Center for Zoonotic, Vector-Borne, and Enteric Diseases (ZVED): responsible for working to understand, prevent, control, and if possible, eliminate infectious diseases within a larger ecologic context, as this is a global effort.

VIII. Industry response to consumer concerns to assure a safe and wholesome food supply
A. Risk: the uncertainty associated with the possibility of danger, loss, or injury.
B. Risk Management: procedures followed by agriculturalists to ensure that risks associated with the production and processing of edible plant and animal food products are minimized.
3. The USDA Risk Management Agency promotes, supports, and regulates sound risk management solutions to preserve and strengthen the economic stability of America’s agricultural producers.
4. No matter how closely agricultural producers follow risk management procedures, food products still face potential risks.
5. Risks can occur during production, i.e., chemical contamination from pesticides or fertilizers, not cooking beef to the correct temperature or leaving raw beef at room temperature for two hours before cooking.
C. Industry Response to Risks
1. When a problem arises, agriculturalists and government agencies like the USDA play a role in assuring a safe food supply.
2. Investigation of the problem starts with the origin of the product, where products are traced back to the producer.
3. If the risk involves illness among consumers, they are questioned to determine where the contaminated product originated and how the product was handled since being purchased.
4. Policies and procedures are investigated from the farm to the processing plant, to the mode of transportation to the store. Each step of the product process from farm to fork is examined for the potential origin or the risk
5. Products that are thought to be contaminated or hazardous to human health are quickly recalled, or removed, from store shelves so that consumers can no longer purchase the product. Consumers are also informed so that anyone who has already purchased the item can return or discard it
6. Contaminated products can be sent to labs for testing to determine the source of contamination.
7. When the problem is identified, an action plan to correct the situation and prevent future risks is implemented
8. After the risk has been assessed and the products are no longer hazardous, they make their way back into stores.

9. Detailed information about the risk or hazards is typically made public through the media, which can sometimes make a situation sound worse than it is, thus scaring consumers.

10. The FDA and USDA often release statements or other accurate information to assure consumer their food is safe.
### ESSENTIAL STANDARD: 7.00

**OBJECTIVE:**
Understand the importance of food and agricultural product processes

| OBJECTIVE: | 7.01 | 5% | B2 | Understand agribusiness, government, and the consumer role in providing safe agricultural products for consumption |

### OBJECTIVE:
Understand the importance of food and agricultural product processes

### Suggested Activities 7.01

<table>
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<th>Activity Number</th>
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| 7.01.01         | Mapping My Food  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.02         | Tomato Travels  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.03         | Planes, Trains, and Automobiles: A Transportation Tour  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.04         | Fact or Foe: Consumer Perceptions  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.05         | Safety First – Responsibilities for a Safe Food Supply  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.06         | Government Agency Karaoke  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.07         | Stop the Spread – A look at human and animal health issues  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.08         | Disaster Reactor  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.09         | Reading between the Lines  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.10         | “Roll with it”  
Middle School Food and Agricultural Literacy Curriculum |
| 7.01.11         | Chain of Food (6-8th Grade)  
National Agriculture in the Classroom; Agclassroom.org |
| 7.01.12         | Cruisin’ for a Bruisin’ Food Packaging Specialist  
National Agriculture in the Classroom; Agclassroom.org |
| 7.01.13         | A Chilling Investigation (6-8th Grade)  
National Agriculture in the Classroom; Agclassroom.org |

Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA  
National Agriculture in the Classroom; agclassroom.org
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<th>7.01.14</th>
<th>‘Tis so Sweet</th>
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<td>FFA New Horizons Spring 2016, Teaching Guide</td>
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Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Processing food
   A. Reasons to process
      1. to extend shelf life
      2. to prevent foods from spoiling
      3. to keep foods safe
      4. to change the products into different forms for consumption
   B. Methods of processing
      1. Pasteurization
         a. A form of heat processing
         b. Microorganism: small living thing, like bacteria. Destroys pathogenic microorganisms in food, but does not destroy microorganisms that cause spoilage; kills microorganisms that carry diseases and make people sick, but does not kill microorganisms that make the food go bad
         c. Dairy products like milk are examples of foods that are pasteurized.
      2. Dehydration
         a. The process of removing water from foods.
         b. Methods include: sun drying for sun-dried tomatoes, freeze drying for instant coffee, or by using air with a dehydrator for beef jerky
         c. Moisture can be added back into foods that are freeze dried, like instant coffee or mashed potatoes, but moisture cannot be added back into dehydrated foods like beef jerky.
      3. Fermentation
         a. Protects foods against microorganisms
         b. Uses microorganisms like yeast, mold, and some bacteria to preserve and change the state of the food.
         c. Fermented foods include: pickles, olives, sausage, bread, and cheese
      4. Canning
         a. A form of heat processing.
b. Has the longest shelf-life of any heat processed food – can stay preserved for years as long as the package is not damaged.
c. Jars are filled with heated food products, or heated after they are filled.
d. Canner’s brine: liquid added to the jar that can be either sugar- or salt-based and helps with preservation. For example, salt-based brine in a can of tuna, or sugar-based brine in a can of peaches.

II. Safe food handling and cooking procedures
A. FAT TOM: describes the conditions in which pathogens and food-borne illness thrive.
   1. Food-borne illness: an illness that results from the consumption of improperly prepared or improperly stored foods.
B. B. F is for Food: Microorganisms need a food source in order to thrive and reproduce.
   1. Microorganisms thrive in the foods we eat, including milk, meat, and fish for example.
C. A is for Acidity: microorganisms thrive in a neutral or slightly acidic pH
   1. pH measures the level of acidity or alkalinity in a substance.
   2. The danger zone for acidity is between 6.6 and 7.5 which is the ideal environment for microorganism to live.
   3. The pH scale ranges from 0 to 14; acidic foods range from 0 to 6 on the pH scale, and basic or alkaline foods range from 8 to 14 on the pH scale; a pH of 7 is considered neutral.
   4. The higher the acidity the lower the pH and the lower the acidity, the higher the pH.
D. T is for Time: the danger zone for time is two hours.
   1. During the two-hour period, microorganisms reproduce very quickly and contaminate the food.
   2. If food is unrefrigerated outdoors or at room temperature for two hours or longer, throw it away.
E. T is for Temperature; 40° to 140° F is the danger zone.
   1. Keep cold foods cold and hot foods hot.
   2. Store cold foods at temperatures less than 40°
   3. Store hot foods at temperatures higher than 140°
   4. Cook foods to internal temperatures ranging from 145°F to 180°F depending on the type of food or meat.
F. O is for Oxygen: some microorganisms need air to grow, and others can grow in conditions without air.
   1. Aerobic: oxygen (air) is required for growth.
   2. Anaerobic: oxygen (air) is not required for growth; can grow without it.
G. M is Moisture: microorganisms require a water supply to grow and thrive.
   1. Foods like beef jerky, uncooked pasta, or crackers do not have high moisture content and are less susceptible to microorganisms.
   2. Foods like bread have higher moisture content and are likely to attract microorganisms, like when bread turns moldy.
H. Other helpful hints to keep foods safe and prevent food borne illness.
1. Separate cooked and uncooked foods: do not cross contaminate by putting fresh vegetables on a cutting board that was previously used to prepare raw chicken, unless the cutting board is washed with soap and hot water.
2. Wash hands and use utensils when possible: handle foods with clean hands.
3. Marinate in the refrigerator: keep foods cold while they are marinating to maintain a safe pH and temperature zone.
4. When in doubt, throw it out: if you have the slightest thought a food might be safe, do not eat it.

III. Processing from farm to fork
   A. Animal selection
      1. Animals are selected for harvest when they have arrived at their target market weight
      2. Some animals are genetically selected to serve as meat animals; meaning that their genetics are ideal for making a flavorful meat product
   B. Harvest
      1. Harvesting is made up of a careful process to ensure that the animal is treated in a humane way and our food supply is safe to eat
         a. Handling/holding areas are designed to make moving animals as stress free as possible
         b. Animals are harvested; the carcasses are sent through a final wash and then chilled for at least 24 hours
         c. Inspection – examination or review of the animal. The USDA (United States Department of Agriculture) inspector will examine parts of the carcass to ensure that the animals is healthy and safe for human consumption.
   C. Processing
      1. Fabrication – the breaking down of a carcass of meat into consumer cuts
         a. Once the carcass is chilled, it is broken down into smaller cuts for resale during the fabrication process
         b. Wholesale cuts – the sale of goods in quantity for resale (i.e. beef wholesale cuts include the round, chuck, short loin, etc.)
         c. Retail cuts – the sale of goods in small quantities to consumers (i.e., pork retail cuts include tenderloin, chops, ribs, etc.)
         d. Value-added products – a change in the physical state or form of the product; the production of a product in a manner that enhances its value (i.e., sausage, chicken patties, etc.)

IV. Main processing steps in plant products
   A. Harvesting
      1. Most plants are harvested in the fall in the United States
      2. Fruits and vegetables are tested for maturity by checking firmness and color. If they are mature, they are picked by hand or mechanically from their growing location.
   B. Reception
      1. The plant products are hauled by truck to the processing plant
2. At this point, they are inspected visually for any blemishes that may cause an issue with integrity or sanitary issues.

C. Size and Grading
   1. Fruits and vegetables are first sorted by size and separated out based upon dimension and firmness
   2. After they are sized, they are graded based on appearance and internal quality, which consists of any errors in color, external blemishes, or firmness of the plant product.

D. Washing
   1. External dirt and chemicals left on the peels are removed through a water bath.
   2. After this, water spraying and scrubbing may take place for further cleanliness.

E. Peeling and Coring
   1. Using a machine, the peel and core can be removed from the plant product or left on depending on product uses. The core is the center part of the fruit containing the seeds.
   2. This can also be done by hand using a paring knife, but is not completed by hand in large processing plants.

F. Slicing
   1. Processed plant products are then sliced into even size by machine.

G. Preserving
   1. The sulfuring process prevents browning of fruits and vegetables. This takes place in a factory using chemicals.
   2. Coating apple cuts, slices, and dices with a solution of 50% water and 50% lemon juice discourages the browning process

H. Drying
   1. Large dehydrators are set at high temperatures to remove water from the plant products
   2. They are then dried to desired crispness. Some products can still be pliable while others can be of potato chip consistency

I. Temporary Storage
   1. Once fruits and vegetables are dried, they are placed in temporary storage for packaging.
   2. From temporary storage, products will travel down a conveyor into sorting for packaging.

J. Packaging
   1. Fruits and vegetables that are preserved are placed in airtight plastic bags for storage and shipment
   2. Those that have not been preserved are packaged among soft crate trays or bags to minimize bruising and spoiling

K. Shipping
   1. Fruits and vegetables are then packaged and shipped in crates to destinations based upon variety and local demand

V. Processing milk products
A. Milk is obtained from the cow
   1. This happens under sanitary conditions – from this point on, it is never touched by human hands
   2. Milk is cooled to 45°F (7°C) within 2 hours of milking.
B. Once cooled, milk is picked up by a hauler who pumps the milk from farm's bulk tank into the milk truck
   1. The truck is refrigerated, keeping the milk cool at all times
   2. A hauler may pick up milk from more than one farm, so a truck load may contain milk from several farms when it is delivered to the processing plant.
C. Milk is then unloaded at the processing plant.
   1. At the plant, it is stored at less than 45°F.
   2. Within the plant, it is usually processed within 24 hours.
D. To begin processing, standardization occurs. Standardization is where the original fat content of the milk has been changed to make all milk standard.
   1. Milk is processed through separators to create a skim portion and a cream portion of the milk.
   2. The skim portion and the cream portion are then recombined to form whole milk (3.25% fat), 2% and 1% fat milk, and skim milk (<0.1% fat)
E. Once standardization is finished, pasteurization happens. Pasteurization is the application of heat to destroy human pathogens in foods.
   1. Milk is heated to 151°F for 30 minutes.
   2. This results in fresh tasting milk that meets consumer safety specifications.
F. Lastly, milk goes through homogenization. Homogenization is breaking up the fat particles within milk and dispersing them uniformly.
   1. Milk is subjected to extremely high pressure to break up fat particles.
   2. This prevents the cream from rising to the top during storage in the refrigerator.
   3. Once this is completed, milk can be bottled or sent for secondary processing.

VI. Processing Dairy
A. Once milk has been processed, it can be used to form any dairy products. These include ice cream, yogurt, butter and cheese.
B. Ice Cream Processing
   1. Blend the ice cream mixture by mixing liquid and dry ingredients.
   2. Pasteurize mix at 155°F for 30 minutes.
   3. Homogenize for smoother ice cream.
   4. Age the mix at 40°F overnight to allow ice cream to set before freezing.
   5. Add liquid flavors and colors for different tastes.
   6. Freeze ice cream as quickly as possible to a temperature of less than -13°F
C. Yogurt Processing
   1. Inoculate with bacteria for fermentation, where bacteria are mixed into the cooled milk.
   2. Hold at 108°F (42°C.) This forms a soft gel and the characteristic flavor of yogurt. This process can take several hours.
3. Cool the yogurt to 7°C to stop the fermentation process
4. Add fruit and flavors
5. Package by pumping from the fermentation holding tank.

VII. Processing aquaculture and seafood products
A. Cleaning- filleting and gutting fish
   1. Fish tissue is the most perishable food items
   2. Fresh fish must be cleaned, gutted, and placed on ice as soon as possible to remain as fresh as possible
   3. Can be completed on the fishing boat or off, depending on the size of the fish and the type captured

B. Smoking
   1. Very popular with Atlantic salmon and other seafood
   2. Similar throughout the world through this age-old process
   3. Preservation can be accomplished by first cutting the fish into thin strips and then drying them slowly over a fire.
   4. When the fish is packed as a dried smoked product, it can travel great distances and remain edible for long periods of time

C. Marinating and preparing seafood mixes
   1. Creates different, flavorful types of seafood for purchase
   2. Quite often used to retain moisture and flavor, these processing techniques are combined with preservatives to last longer, creating seafood items that can be integrated with other types of foodstuff.

D. Canning
   1. Canned tuna is the number one consumed seafood product in the United States
   2. Once tuna are cleaned and sorted by size, they are pre-cooked and then cooled overnight.
   3. All of the white and dark meat is separated by hand. The white meat receives a premium price.
   4. Afterwards, they are compacted into cans and vacuum-sealed for shipment for stores.

E. Freezing
   1. Most common method of processing seafood
   2. Upon completion of cleaning and filleting, glaze or flash freezing is used to lock in the freshness and flavor of the fish for long periods of time.
   3. This is the process used for most non-battered or breaded fish products found in the grocery store.

F. Preparing shaped and breaded products
   1. Examples: fish fingers and nuggets
   2. One of the most popular seafood processes among young people
   3. The meat of fish that have been deemed unusable for the other processes must be pressed into large blocks
   4. These blocks are then cut to size for the food, covered with a thin layer or breading, then pre-cooked before being frozen

G. Opening oysters and other shellfish
1. Oysters can be eaten on the half shell, raw, smoked, boiled, baked, fried, roasted, stewed, canned, pickled, steamed, or broiled.
2. They have the longest shelf-life of all seafood at 2.5 weeks.
3. Fresh oysters must be alive just before consumption or cooking.
4. There is a simple criterion; the oyster must be capable of tightly closing its shell, otherwise it is unsafe.
5. Opening oysters requires skill, a sharp knife, and heavy gloves. The shell can also be sharp.
6. Profession shuckers require less than three seconds to open an oyster.

H. Grading and boiling prawns and other crustaceans.
   1. Since pawns, more commonly known as shrimp, are animals with hard shells, the first task is removing the outer shell. This is known as peeling. Once this is completed, they are chopped and washed, then sorted and placed in trays or other containers based upon size.
   2. Most of these tasks can be done by machine.

VIII. Raw material verses finished product
A. Separation – an important process that separates food from non-food items
   1. Examples
      a. Shell from nuts
      b. Skin from potatoes
      c. water from vegetables
B. Disintegration – making small pieces out of larger pieces of food
   1. Examples
      a. Grinding (ground beef)
      b. Cutting (fresh cut lettuce)
      c. Shredding (cheese)
C. Mixing
   1. Mixing dry ingredients together
   2. Mixing ice cream to create new flavors
   3. Mixing seasoning with meat to add flavor
D. Drying – removing water with minimum damage from the food
   1. Evaporation using the sun or a heat dehydrator, like beef jerky
   2. Boil off water such as boiling sugar syrup to make hard candy
   3. Freeze Dry – freeze food then dehydrate to create frozen juice products
E. Forming – forming foods into a certain shape or thickness helps establish uniformity
   1. Hamburger patties
   2. Candy
   3. Breakfast cereals and snack foods
F. Packaging – used to preserve, protect, and make the food product easy to use.
   Common packaging types are:
   1. Paperboard – cardboard boxes
   2. Metal Cans – soup, vegetables, fruits
   3. Glass – mayonnaise, salad dressing
   4. Plastics – meat, ketchup, TV dinners
IX. Economics of processed versus raw products
A. The farmer is the one who produces the raw product.
   1. A raw product is a food product that has not had any processing steps performed. It enters the store the same way that it was when it was removed from the plant.
      a. In a typical economy, the producer receives the majority of the money when a consumer purchase something from a store. In the agricultural industry, the economics are actually different. To produce the food, we know today, many costs are factored into the price of food, none of which come from the farmer.
      b. For example, Nectarine farmers are receiving only about 4 cents per pound of fruit, while consumers pay an average of $1.99 per pound at the grocery store. The farmers’ portion accounts for only 2 percent of the price consumers pay. Packing charges, pre-cooling and handling at the packing shed, and sales commissions account for 20 percent of the costs, while retail markup accounts for 78 percent of the costs.
      c. The farmer is known as a price-taker. A price-taker is an individual or company that is not influential enough to affect the price of an item.
      d. Therefore, even when raw products are sold at farmer’s markets or local grocery stores straight from the fields, prices on raw foods are significantly lower because the individual farmer takes the price he can get for his sales. This only changes if the farmer offers specialty products such as organic or rare foods.
   2. Raw products are often hard to sell because of their low shelf-life and inability to be sold in areas a great distance away. Instead, food product companies turn to processed products to sell. Processed products are food products that have undergone physical or chemical treatment resulting in a substantial change in the original state of the food. A majority of the retail cost consumers pay at the store goes to processing, packaging, marketing, sales and distribution, taxes and wholesale and retail markup to cover such expenses as labor and store operation.
      a. Food processing companies, on the other hand such as General Mills or Kraft, are price makers. Price makers are an individual or company which is influential enough to affect the price of an item.
      b. For example, on processed products such as Fig Newton, fig growers receive about 14 cents from a $3.79 bag of the popular fig bars or about 3.7 percent. In Red Vines candy, wheat farmers receive 8.5 cents or about 1.2 percent of the 5 pound container costing $6.99.
      c. These companies can demand higher prices because of factors such as brand name, packaging, advertising, and processing costs. Most consumers will pay these higher prices because of the ease of consumption compared to raw foods that have to be cooked at home.
d. Eventually, these prices may increase to appoint where consumers are no longer willing to purchase the product. Instead of buying expensive processed foods, consumers may purchase raw foods from the local level to save on costs.
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<th>Activity</th>
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<tbody>
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<td><strong>Processing Our Food</strong></td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>7.02.02</td>
<td><strong>How to Avoid the Danger Zone</strong></td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>7.02.03</td>
<td><strong>From Farm to Fork</strong></td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>7.02.04</td>
<td><strong>An Apple of an Adventure!</strong></td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
</tr>
<tr>
<td>7.02.05</td>
<td><strong>Moooving Milk from the Farm to the Fridge</strong></td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>7.02.06</td>
<td><strong>Something’s Fishy about Processing!</strong></td>
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<td><strong>Constructing the Process</strong></td>
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<td>7.02.08</td>
<td><strong>Let’s Supply a Little Demand for Food!</strong></td>
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<td>7.02.09</td>
<td><strong>Cooking Right – The Science of Cooking a Hamburger</strong></td>
<td>National Agriculture in the Classroom; agclassroom.org</td>
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<td>7.02.10</td>
<td><strong>FoodMaster Middle: Yogurt</strong></td>
<td>National Agriculture in the Classroom; agclassroom.org</td>
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<tr>
<td>7.02.11</td>
<td><strong>Fruits of our Labor</strong></td>
<td>National Agriculture in the Classroom; agclassroom.org</td>
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<td><strong>Good Guys or Bad Guys?</strong></td>
<td>National Agriculture in the Classroom; agclassroom.org</td>
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<tr>
<td>7.02.13</td>
<td><strong>Ultra-High Pressure Treatment</strong></td>
<td>National Agriculture in the Classroom; agclassroom.org</td>
</tr>
</tbody>
</table>
I. Food Security
   A. Food security – defined as access by all people at all times to enough nutritionally adequate and safe food (quality, quantity, and variety) for an active and healthy life.
      1. We must create the conditions in which all people can secure the food they need and be well nourished in a dignified and sustainable way.
      2. Food security is affected by a number of factors including, primarily, the food supply and access to jobs and such basic services as education, health facilities, sanitation, clean water, and safe housing.
      3. Poverty, social inequality, and lack of education are primary causes of hunger and malnutrition and are major obstacles to obtaining food security.
      4. Food security cannot be ensured only by producing more food. If, for example, people cannot afford the food that is available, if their diets lack essential vitamins and minerals, or if poor handling during processing and distribution makes their food unsafe to eat, they will not have food security.
   B. To have food security globally depends on three pillars, or legs of support
      1. Food must be available, meaning that adequate amounts of good-quality, safe food must be produced or imported at the national and local levels.
      2. Food must be accessible, meaning that it must be distributed and available locally and it must be affordable to all people. Transportation methods must be in place.
      3. Food must be used in the best way possible for each person to be healthy and well nourished (sufficient in quantity, quality, and variety for each individual’s needs)
   C. To achieve national food security, a country must be able to produce or import the food it needs, and be able to store it, distribute it, and ensure equitable access to it.
      1. For families to achieve food security, they must have the means to produce or purchase the food that they need and they must have the time and knowledge to ensure that the nutritional needs of all family members are met.

Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.
II. Imported and Exported Foods
   A. Export – goods or any articles of trade or commerce sent out of a country to another country. These five categories are the main areas of exports from the United States to other countries
      1. Red Meat Products- beef, pork, lamb
      2. Poultry Products – chicken, duck, eggs
      3. Dairy Products – milk, yogurt, cheeses
      4. Grains and Feeds – wheat, corn, rice
      5. Soybeans
   B. Import – goods or any articles of trade or commerce shipped into a country or region. These five categories of imports are the main imports into the United States from other countries.
      1. Coffee
      2. Fruit – bananas, mangoes, pineapples
      3. Oilseeds and Products – vegetable oils
      4. Vegetables – tomatoes, peppers, cucumbers
      5. Cocoa

III. Explore techniques used to market food products
   A. Product – merchandise: commodities offered for sale. Grocery stores tend to break their product into different departments for convenience and marketability.
      1. Grocery/General Merchandise – this includes canned foods, pastas, boxed foods, cereals, and other foods that do not fall into their categories
      2. Meat and Deli – both fresh and packaged meats are sold in the meat and deli area. Some stores even have butcher shops present.
      3. Frozen Foods – from TV dinners to ice cream, the frozen foods area has a variety of foods to be marketed and sold.
      4. Bakery – breads, cakes, and cookies are items commonly found in the bakery. These items can be delivered or baked in the store
      5. Produce – fresh fruits and vegetables are products that are found in the produce isle. This has become an especially popular department to have because of the demand for fresh foods.
      6. Dairy – milk, cheese, yogurt, creams, and other dairy products are found in this grocery department
   B. Price – the cost of a food item
      1. Customers generally shop at grocery stores closets to them. Therefore, stores need to offer price specials, promotions, and low prices to attract customers.
      2. This can also work in the opposite way. Gourmet or high end products can be sold at high prices where there is a high demand to also attract customers
      3. Coupons also affect price and the number of food products purchased.
      4. Food products that are seasonal are also affected by pricing.
   C. Place – the location in which the food is placed, both the geographical location of the grocery store and food location in the store.
1. Some foods may only be available regionally. For example, fish and seafood. Grocery stores cater their food choices based upon regional preference.

2. Grocery stores are also placed in regions where there is a market for those needing to purchase food. Large cities such as New York and Chicago have many different stores within walking distance for various neighborhoods to be able to shop.

3. Location of food within the store is also important. Foods that are necessities such as dairy products or bread are often placed in the back of the store to draw customers all the way through the store. Impulse foods such as junk food or rare items are often placed near the cash register to encourage more purchase.

D. Promotion – activities, materials, and techniques used to supplement traditional sales.
   1. Frequent shopper, senior discount, carry-out, and other promotions in grocery stores help boost sales and retain customers.
   2. Advertising in many different ways promotes both the food product and the supermarket. Whether it’s commercials, newspaper ads, or radio ads, these advertising techniques affect promotion of the food product.
   3. Grocery store departments can also offer “specials” where the price is significantly lower, i.e. meat is on sale on Wednesdays.

IV. Math concepts related to food marketing and economics
   A. High Quality or Service
      1. People buy quality food.
      2. People will pay extra for quality or name brand.
   B. Low Cost
      1. People buy low cost food
      2. People will pay the lower cost if there is no difference between quality
   C. Demonstrated Value - is something you can taste, smell, feel, hear or see.
      Something is useful or time saving.
      1. For example, no pulp orange juice because of the taste or flavor.
   D. Perceived Value- something we think is good or better than the rest
      1. Example – Brand names: organic home-made
   E. Price – the determining factor on food sales
      1. If there is a demonstrated value and a perceived value, the price can be higher
      2. If not, we buy the cheaper product.
   F. Demonstrated value plus Perceived value divided by Price is greater than or equal to 1; or, $DV + PV/$

V. Marketing Infrastructure for agricultural commodities
   A. Certified Angus Beef –marketing infrastructure used to promote the Angus breed as a source of beef to consumers
   B. Vertical Integration – the control by a single firm of two or more stages in the chair of production, processing, and distribution.
   C. Commodity – a transportable product with commercial value
   D. Market – a place where goods or commodities are offered for sale or exchange
VI. Food label
   A. A food label is comprised of four parts
      1. Serving size
      2. Calories
      3. Nutrients
      4. Footnotes
   B. Serving Size
      1. Details the number of servings in the package
      2. Serving size standardizes food portions and allows consumers to compare
         foods through similar units of measure
      3. The size of servings in the packaging influences the number of calories in
         the food. Pay close attention to serving size because you may accidentally
         consumer too many calories by consuming multiple servings.
   C. Calories (and Calories from fat)
      1. A measure of energy in each serving of the packaged food.
      2. Calories from fat are added to detail how many of the total calories are
         derived from fat.
      3. Many Americans consume too many calories and this portion of the label
         helps consumers manage their caloric intake.
      4. General Calorie Guide: 40 Calories is low, 100 Calories is moderate, 400+
         Calories is high
   D. Nutrients
      1. This section details the quantity of specific nutrients offered by each
         serving of food.
      2. Nutrients include – total fat (saturated and trans fat,) cholesterol, sodium,
         total carbohydrate, dietary fiber, sugar, protein, Vitamin A and C, calcium
         and iron
      3. The FDA breaks the nutrients into two groups to assist consumers in
         healthy choices.
         a. Nutrients to be limited – fat (saturated and trans fat,) cholesterol,
            and sodium. Americans consume enough or too much of these.
         b. Nutrients to get enough of – dietary fiber, vitamin A, Vitamin C,
            calcium, and iron. Most Americans don’t get enough of these
      4. Footnotes
         a. This is a required statement that tells the consumer that the
            percentage daily values (%DV) are based upon a 2,000-calorie
            diet.
         b. The percentage daily values (%DV,) which is at the top and right
            side of the food label, tells the consumer what percentage the food
            accounts for the total dietary amount required for each day.
         c. 5% or less is low; greater than 20% is high.

VII. Nutritional content of food products
   A. All nutrition label facts are based upon a 2,000-calorie diet.
      1. This is the Daily Values (DV) intake per serving for each nutrient
         suggested by public health experts
      2. The label also offers intake suggestions for a 2,500-calorie diet as well.
3. Both of these suggested diets are displayed in the footnote of each label and do not changing from product to product because it is dietary advice for all Americans.
   a. The footnote must be on all foods unless the food package is too small to contain the footnote.
4. Daily Values (DV) nutrient values in the footnote are noted as “Upper Limit” nutrients or “Lower Limit” nutrients.
   a. Upper limit nutrients are those you should eat “less than” the suggested daily value for that nutrient. In other words, you should eat the suggested value or less for fat, saturated fat, cholesterol, and sodium.
   b. Lower limit nutrients are those you should eat “more than” the suggested daily value for that nutrient. In other words, you should eat the suggested value or more for total carbohydrates and dietary fiber.

B. Percent Daily Values (%DV)
1. The right side of each label presents the Percentage Daily Value (%DV) of key nutrients for one serving of the packaged food.
   a. The percent daily value (%DV) is for the 2,000-calorie diet only.
2. This reference allows the consumer see what percentage of the key nutrients the single serving of packaged food accounts for in a daily 2,000-calorie diet.
   a. It also assists the consumer in determining if a serving of the packaged food is high or low in a nutrient.
   b. A general rule of thumb is that if the food has a %DV of 5% or less it is low for a nutrient and a %DV greater than 20% would indicate it is high for the nutrient

VIII. Food claims on food product labels
A. The food and Drug Administration has developed specifications for health claims and descriptive terms for food packaging.
   1. These terms or claims are standards, which communicate to consumers a consistent vocabulary concerning claims made by food manufacturers for marketing purposes.
   2. Each term or claim is linked to a standardized measurement for a given nutrient on a foods nutrition label.

IX. Food Pyramid
A. The UDA’s Food Pyramid and the FDA’s Nutrition Facts Labels are very similar, but they play different roles for consumers. Each compliments the other if they are used properly.
   1. The obvious difference between the USDA’s Food Pyramid and the FDA’s Nutrition Facts Labels is serving size.
      a. The USDA’s Food Pyramid is a general guide to assist consumers on a daily basis to meet nutrient recommendations based upon easy to remember serving sizes.
      b. The FDA’s Nutrition Facts Labels provide detailed nutrient information for a specific food to be compared to similar foods.
X. Interpreting and calculating information on food labels
   A. Calculation of calories in a recipe can be accomplished in six simple steps:
      1. First, separate the packaged foods from the non-packaged foods in the
         recipe.
      2. Second, record the number of calories in each serving of the packaged
         foods according to the food’s label. If the food uses multiple servings
         record the total calories (i.e. – granulated sugar contains 774 calories per
         cup. If a recipe calls for 2 cups of sugar, record 1,548)
      3. Third, determine the number of calories in the non-packaged foods. This
         can be found online at United State Department of Agriculture’s National
         Nutrient Database
            a. Type in the desired food name and select “search.”
            b. Select the specific desired food from the search results and select
               “submit”
            c. Select the desired measure, (grams, cups, or ounces,) and select
               “submit”
            d. Reference the desired nutritional information (Calories are
               referenced as “Energy” in “kcal” units)
            e. Repeat for each non-packaged food
      4. Fourth, add the total number of calories for both packaged and non-
         packaged and no-packaged foods.
      5. Fifth, identify the total number of servings in the recipe.
      6. Sixth, divide the total number of calories in the recipe by the total number
         of servings in order to determine the calories per serving.
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<th>FOOD SCIENCE</th>
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<td>7.00 15%</td>
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<td>Understand the importance of food and agricultural product processes</td>
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<td>OBJECTIVE:</td>
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<tr>
<td>7.03 5%</td>
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<td>Understand marketing and labeling principles that help consumers</td>
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</table>

Sources of Information:
- Middle School Food and Agricultural Literacy Curriculum – National FFA
- FFA New Horizons Teaching Guide

**Suggested Activities 7.03**

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<tr>
<th>Activity Number</th>
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Middle School Food and Agricultural Literacy Curriculum |
| 7.03.02 | **It's a Global Food Chain**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.03 | **This Little Student Went to the Market**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.04 | **Crunching Numbers - Food Science Style**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.05 | **Embarking on Food Marketing**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.06 | **It's All in a Label**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.07 | **Weighing Your Options**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.08 | **The Truth behind the Label**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.09 | **Teamwork – the USDA’s Food Pyramid and the FDA’s Nutrition Fact Labels**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.10 | **Trail Mix Math**  
Middle School Food and Agricultural Literacy Curriculum |
| 7.03.11 | **Food Security: Global Perspective**  
National FFA Organization |
| 7.03.12 | **Convincing Cotton Cynics**  
FFA New Horizons Teaching Guide |
| 7.03.13 | **Talking Points: Food Waste**  
FFA New Horizons Teaching Guide |
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<tr>
<td>OBJECTIVE:</td>
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<td>Understand the role of research in the agricultural industry</td>
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Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA

**Note to teacher:** Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Academics in agriculture
   A. Application of science in agriculture
      1. Fertilizer application – to produce food and products more efficiently, scientist discovered how elements make plants grow. This agriculture technology allowed us to produce more products in less time and space.
         a. Today, we produce more corn per acre than in the early 1900s because the plant grows taller with more ears of corn rather than outward which would require more space.
   B. Application of mathematics in agriculture
      1. Feed Calculations – to determine how much feed a market hog needs you must use basic algebra
   C. Application of the language arts in agriculture
      1. Magazines, journals, newspapers, blogs – to write for an agricultural magazine or journalism entity, you must have strong writing and language skills

II. Outcomes of agricultural research
   A. Nutritional outcomes and reductions in food-borne illness
      1. Mandatory use of the Nutritional Fact Card on all human food products
      2. Education of consumers on proper cooking and storage of food products
      3. Stringent guidelines for processing and handling of food products by producers and processors
      4. Real life example: Increase promotion to consume soy-based foods supporting healthy diets and benefiting soybean growers, processors, and consumers.
   B. Enhanced biosecurity
      1. Increased attention to the risk of bioterrorism
      2. Improved microbiologic food safety
      3. Education of hazards of food allergens and toxicants
4. Education of plant and animal diseases
5. 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.

C. Animal welfare
1. Improved quality of feed for animals
2. New management practices to improve quality of life
3. Improved prevention of animal disease and hazards
4. 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.

D. Environmental benefits
1. Reduced pollution and conservation of benefits
2. Advanced environmentally sound alternatives
3. Integration of leading-edge environmental-science concepts and technologies
4. Real life example: Standards are being established on nutrient water quality standards and their relationship to agriculture practices

E. More and varied products
1. Increased availability of off-season products
2. Creation of niche markets
3. Increased use of value added markets
4. Real life example: Use wool from sheep and goats for products such as filters to reduce livestock odor in confinement operations.

III. Modern conveniences as benefits of research
A. Food
1. Higher producing cows -Milk
2. Round-up ready soybeans
3. Yellow watermelons
4. Longer lasting fruit
5. Minerals to feed livestock
B. Fiber
1. Abundant clothing materials
2. Readily available lumber supply
3. Toilet Paper
C. Natural Resources
1. Clean water
2. Minerals to feed livestock
3. Rotational grazing patterns

IV. Steps in the scientific research method
A. Scientific method: a method of research in which a problem is identified, relevant data is gathered, a hypothesis is formulated from these, and the hypothesis is tested.
1. Observation: noticing an instance and occurrence for scientific purposes.
2. Question: a statement written about what you observe.
3. Hypothesis: educated guess on how things work
4. Test: experiment to determine if your hypothesis is false or true
   a. Collect data: individual facts, statistics, or information
5. Conclusion: formation of a theory based on observations and data
   a. Create charts based on individual data
   b. Discuss data and conclusions based on graphic representation

V. Research Marketing
A. Key terms related to research in agriculture
   1. Market survey: taking a formal view of praise of discontent about a
      subject by a group of people.
   2. Commodity: an agriculture product that has value
   3. Perception: intuitive recognition by the senses or the mind
B. Role of market research in agriculture
   1. What are perceptions?
   2. How do we create perceptions?
C. Create a market survey
   1. Ask a standard set of questions
   2. Create a simple form
   3. Make your written survey easy to read
   4. Identify who should fill out your survey
   5. Give enough time for people to answer the questions
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**OBJECTIVE:**

Sources of Information:
- Middle School Food and Agricultural Literacy Curriculum – National FFA
- National Agriculture in the Classroom; agclassroom.org
- National FFA Organization
- North Carolina FFA Association

### Suggested Activities 8.01

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<tr>
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| 8.01.01 | **Who Helps Agriculture**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.02 | **Agriculture research goals**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.03 | **Consumer benefits from research**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.04 | **Practicing the Scientific Research**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.05 | **Research in Agriculture**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.06 | **Germination Research**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.07 | **Researching Plant Growth Conditions**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.08 | **Drawing Conclusions**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.09 | **Research Marketing – to Buy or not to Buy**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.01.10 | **National Agriscience Fair**  
**[www.ncffa.org](http://www.ncffa.org)**  
**[www.ffa.org](http://www.ffa.org)** |
| 8.01.11 | **Mystery Juice**  
National Agriculture in the Classroom; agclassroom.org |
**Note to teacher:** Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. **Agriculturally-related Biotechnology**  
   A. Biotechnology: using living organisms to make products useful to humans  
   B. Examples of agriculturally-related biotechnology  
      1. Plant  
         a. Crops resistant to plant diseases  
         b. Crops resistant to insect pests  
         c. Making the food we eat more nutritious  
         d. Helps make our food last longer  
         e. Increases disease-fighting nutrients in plants  
      2. Animal  
         a. Produces new animal vaccines  
         b. Helped develop artificial insemination  
         c. Transfer embryos, or fertilized eggs, from one cow to multiple cows  
         d. Allows livestock producers to pick the sex of their animals  
         e. Researchers are locating genes that cause genetic diseases, such as Down’s syndrome  
      3. Medical  
         a. Pharming is used to producing organisms to be used in pharmaceuticals  
         b. Using pigs to produce organs for human organ transplants  
         c. Using bananas as an edible food vaccine  
         d. Created “golden rice” to help people fight vitamin A and iron deficiencies  
         e. Reduce allergens in food  
      4. Environmental  
         a. Using plants and animals to detect pollutants in our environment  
         b. Develop oil eating bacteria to help clean up oil spills  
         c. Increase the yield from crops instead of tearing down forests to create more farmland
d. Develop crops that can withstand harsh temperatures, such as extreme heat or cold
e. Finding a way to develop biodiesel in a way that is cheaper than fossil diesel

II. Influences of biotechnology on agriculture
A. Advantages:
   1. Reduces the use of pesticides on our crops
   2. Crops that are able to grow in salty soils or in drought conditions
   3. Using gene therapy we can treat and cure genetic diseases that were once thought to be incurable
   4. Farmers are able to make more money because crops are higher quality and in some cases, their crops are increasing yield
   5. Increases the shelf-life of our food
B. Disadvantages
   1. Concerns over transgenic organisms that may insert a plant gene into an animal gene or vice versa
   2. Could cause allergic reactions with people who suffer from some type of food allergy
   3. Long-term effects of some biotech products are not yet known
   4. A decrease in biodiversity, or number and variety of organisms
   5. A crop that is herbicide resistant may transfer some of its traits to a weed. Then this superweed could not be killed by herbicides.

III. Emerging agricultural technologies
A. Global Positioning Systems
   1. Produce maps of fields for farmers
   2. Supply important information such as soil type, moisture, yield of crop and weed/insect problems
   3. Reduces waste of materials
   4. Reduces expenses long term, increasing yield
B. Robotics in agriculture
   1. Milk cows
   2. Shear sheep
   3. Harvest fruit
   4. Weld metals
   5. Decrease labor
   6. Increase safety
C. NASA and agriculture
   1. Determine how “green” regions of the world are
   2. Provide large amounts of data on how food is grown on earth
   3. Allows food shortage predictions
D. Radio Frequency Identification and agriculture
   1. Help to identify and track animals, objects, and products
   2. Example: Dairy cattle operation uses RFID to read a cow’s tag as she is milked to track milking average, total gallons collected, how much she eats, etc.

E. Phone-controlled sprinklers
1. Control hundreds of sites and monitor weather conditions from on central location
2. Can send alerts to central location when there are problems with irrigation

IV. Robotics in Agriculture
A. Pros
1. May be able to work in all weather conditions
2. Do not get tired
3. Help produce animals and crops more efficiently
4. Free up producers to do other tasks
5. Can work in more dangerous environments without risking health of producers
6. Usually work much faster than humans
7. More uniform products
8. More jobs are created for people to repair and design new robots
9. Can be very precise, therefore reducing the amount of seed and chemicals used on fields

B. Cons
1. New technology is very expensive
2. Might take away job opportunities
3. Agriculture skills are not the same each and every time so it might be hard to get robots to do jobs correctly
4. Do not have the ability to feel with emotions
5. Repair cost can be very expensive
6. Cannot solve problems as well as humans
7. Lose one-on-one contact with your animals
8. Humans still must be there to monitor robots in case of a problem or to start it, in many cases
9. Very high startup cost for producers

V. Technologies and resulting impacts on plant production
A. Innovation: the ability and desire to introduce new ideas and technologies to create change
1. Critical for the advancement of any industry
2. Often the result of creative and dedicated farmers and researchers who apply knowledge of basic life sciences to everyday problems

B. Examples of innovative technologies in agriculture
1. Precision Agriculture: a process of using technology to create an exact science so that a farmer receives the greatest crop yields at the lowest cost to reap the maximum profit, while reducing waste and maintaining the integrity of the environment
   a. Using global positioning systems (GPS) computers use satellites in the earth’s orbit to triangulate their exact positions on the ground
   b. By using GPS, farmers can plow, harvest, fertilize and apply pesticides to their crops all without turning a wheel or pressing a button.
   c. Using robotic tractors, navigated by GPS, farmers are able to harvest crops more efficiently, use less water, and prevent
chemical runoff as fertilizer and pesticides are applied more systematically and accurately

2. **Hydroponics: the practice of growing plants in the absence of soil**
   - a. Strawberries grow very well in a greenhouse in the absence of soil
   - b. Method saves water because the water goes directly to the root and does not run off through the soil

3. **Genetically Modified Crops: alternating an organism’s genes to reach a desired effect**
   - a. Over 300 million acres of crops planted are genetically modified including disease or pest resistant
   - b. Herbicide-resistant crops: live even when sprayed with herbicides.
   - c. Many fruits and fleshy vegetables (tomatoes) are being modified to prevent over ripening so that they can be stored and transported over longer distances.
   - d. Researchers are working to modify crops that will increase the health of consumers, such as fruits that contain fatty acids and bananas that contain vaccines

VI. **Genetically Modified Organisms**
   A. A genetically modified organism (GMO) or genetically engineered organism (FEO) is an organism whose genetic material has been altered using genetic engineering techniques
   B. Process for genetically modifying organism
      1. Find a trait in an organism you want
      2. Remove a piece of DNA that causes that trait
      3. Put the DNA into a bacterium
      4. Let the bacteria inject the trait (piece of DNA) into the organism you’re modifying
      5. Grow the new organism
      6. Select the organism that have the trait you were trying to add

VII. **Challenges related to growing plants**
   A. Insects – some insects can damage or even destroy crops
   B. Nutrients – plants need certain nutrients to stay healthy and productive
   C. Weeds – these are plants that compete against the plants you want to grow
   D. Disease – pesky bacteria, viruses, fungi, and other things that kill your crop
   E. Weather – a big factor in growing crops but out of our control
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<th>Course</th>
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<th>Agricultural Science &amp; Technology</th>
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<td>11% B2</td>
<td>Understand the role of science and technology in the agricultural industry.</td>
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<td><strong>Objective:</strong> 8.02</td>
<td>6% B2</td>
<td>Understand concepts and issues related to biotechnology and other emerging technologies in the agricultural industry.</td>
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**Sources of Information:**
- Middle School Food and Agricultural Literacy Curriculum – National FFA
- National Agriculture in the Classroom; agclassroom.org

**Suggested Activities 8.02**

<table>
<thead>
<tr>
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| 8.02.01         | **Identifying Biotechnology**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.02         | **The Pros and Cons of Biotechnology**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.03         | **Emerging Technologies in Agriculture**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.04         | **Robotics in Agriculture**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.05         | **Let's Research Technology in Agriculture**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.06         | **Innovation for the future of Agriculture**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.07         | **Franken Foods – Genetically Modified Crops**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.08         | **Plant Doctor – Challenges with Growing Plants**  
Middle School Food and Agricultural Literacy Curriculum |
| 8.02.09         | **Use of Biotechnology in Selecting the Right Plants**  
National Agriculture in the Classroom; agclassroom.org |
| 8.02.10         | **Talking Points: GMOs**  
FFA New Horizons |
| 8.02.11         | **Rise of Robots**  
FFA New Horizons |
## Essential Standard:

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## Objective:

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<td>Recognize issues impacting the agricultural industry</td>
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Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA

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### Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Issues within the agricultural industry
   A. Animal Rights & Animal Welfare
      1. An issues of debate for many years
      2. Animal Rights
         a. The idea that the most basic interests of animal should be the similar interest of humans
         b. Animals should not be exploited or used for human purposes
         c. Animals should not be used for food, clothing, or even companionship
      3. Animal Welfare
         a. The overall humane treatment and well-being of animals, whether they are used for human use and consumption or not.
         b. There is nothing wrong with using animals as resources as long as there is no unnecessary suffering
      4. Animal rights groups
         a. Question commonly used and scientifically-based production practices
         b. Encourage the utilization of free-range production systems, where animals have more freedom to roam, instead of producing animals indoors, where they are protected from weather conditions and natural predators
      5. Poultry and livestock producers (animal welfare supporters)
         a. Recognize and accept responsibilities for the humane care of their animals
         b. Understand the moral and ethical obligation that they have to ensure animal well-being
         c. Realize that consumers are increasingly interested in how the animals used to produce food are raised an trust that those animals were raised in a way that ensured their well-being
   B. Biotechnology
      1. Constantly evolving technology
2. Refers to the application of physical, chemical, or engineering practices to living organisms

3. Improvements made through biotechnology
   a. Improvement of animal production’s impact on the environment
   b. Reduce dependence on agricultural chemicals
   c. Pest/disease-resistant plants and animals
   d. Improved vaccines
   e. Increased milk production in dairy cattle
   f. Improvements of feeds to increase nutritional value
   g. Genetic improvement of livestock to meet consumer demand
   h. Genetically modifying fruits and vegetables to allow for transportations to all parts of the country and world

4. Common concerns of biotechnology
   a. Labeling genetically modified foods for human consumption to allow consumers to choose how their food is produced
   b. Potential for genetic defects and increased risk of disease
   c. Adverse affects these genetic modifications in plants and animals may have on humans when consumed
   d. Foreign markets’ reaction to plants, animals, and food products exported from the US produced as a result of biotechnology

C. Waste Management
   1. Large livestock and/or poultry housing areas can often cause concern regarding proper waste management and their impact on the environment.
   2. Livestock and poultry producers are committed to managing their farms and feedlots in an environmentally responsible manner to protect the environment and conserve natural resources.
   3. Today’s waste management systems capture, treat, and recycle the valuable nutrients produced in manure so they can be used as a natural source of fertilizer.
   4. Producers partner with government agencies, scientists, conservationist, and the communities in which they live and farm.
   5. Some states have put stipulations on farmers and farming operations concerning the odor coming from their facilities. Some require to keep lagoons covered, while other states have enacted zoning ordinances to restrict the development of more of these types of operations.
   6. Waste runoff levels are monitored by the Environmental Protection Agency (EPA) as well as other state and federal agencies to ensure levels are within scientifically-based measurements considered safe for the environment.
   7. Farmers are the first environmentalists, and they continue to strive be on the forefront of technology, research, and best management practices in order to maintain natural resources.

D. Organic Animal Agriculture
   1. Restricts the use of any chemicals such as herbicides, insecticides or fungicides and uses natural elements to fertilize crops rather than using products that had been manufactured.
2. Larger groups incorporating organic foods because
   a. Some consumers believe organically grown food is more nutritious and wholesome
   b. increased availability and awareness of organic food production
   c. Development of worldwide organic standards for food products
   d. Increased financial support and investments for organic food production
   e. Consumers are more financially able to afford additional premiums for organic foods
3. Meat and poultry can also be produced organically and include raising animals without the use of pesticides, growth stimulants, medications, or hormones.
4. Concerns for organic farming
   a. Organic foods are more expensive and of poorer quality
   b. Self-defense mechanisms in plants may often let off more toxins than those that would be applied in pesticides
   c. Some studies have shown that organic foods contain higher levels for unsafe bacteria and other organisms
   d. Organic production requires more land and labor to produce food

II. Consumer, production, and processing issues related to plant production
   A. Stages of producing plant products
      1. Production Phase: the processing of planting, tending, and harvesting plants in order to produce a product
      2. Processing Phase: the processing of plants into products to be used by consumers
      3. Consumer Phase: the phase that starts when the consumer buys a product and ends at the point that it is consumed
   B. Issues related to the three phases of plant production
      1. Chemical and pesticide safety
      2. Genetically modified organisms
      3. Environmental concerns of crop production

III. Consumer, production, and processing issues related to animal science
   A. Stages of producing animal products
      1. Production Phase: the phase of raising and caring for the animal, which includes nutrition, health, reproduction, and growth
      2. Processing Phase: the processing of animals into products to be used by consumers. This includes the processing of livestock, packaging of food, and proper storage and shipping
      3. Consumer Phase: the phase that starts when the consumer buys a product and ends at the point that the product is consumed
   B. Issues related to the three phases of animal production
      1. Animal waste and pollution
      2. Animal welfare
      3. Diseases and food safety

IV. Agriculture
A. Agriculture: all activities involved with the global production of food, fiber, natural resources, horticulture and other plant and animal services

V. Evaluating sources of agriculture issues
A. Resources available
   1. Internet
   2. Newspapers
   3. Magazines of all different types
   4. Interviews – a range of great resources
B. Tips to evaluating resource
   1. Examine the author’s credentials
      a. Who authored the article?
      b. What are the author’s credentials?
      c. Is the author an expert in the topic?
      d. Is contact information provided?
   2. Date
      a. When was this information published?
      b. Is it still applicable?
      c. Is it outdated?
   3. Background:
      a. Who funded the research?
      b. Did a specific organization sponsor this article?
   4. Type of resource
      a. Is the resource educational, opinion, media-generated, a non-profit publication, from a scientific journal, from a fictional or non-fiction book, or a respected document like an encyclopedia or dictionary?
   5. Relation
      a. Does the information address or relate specifically to the topic you’re researching?
   6. Repetition
      a. Has this information been repeated in other resources, or is this something you’ve never seen and can’t find certified in another source?

VI. Agriculture issues in animal science
A. Summarize thoughts for an animal agriculture debate
   1. Why is this issue important now?
   2. What is the nature of the issue?
   3. Who is involved in the issue?
   4. What is the historical background of the issue?
   5. How can this issue be identified?
   6. What are the risks?
   7. Is there a strong disagreement as to how the issue should be solved?
B. Organizing a debate on a current issue associated with animal agriculture
   1. Opening statements for both sides
   2. Arguments for both sides
   3. Rebuttal conference
4. Rebuttals
5. Closing statements for both sides

VII. Current issues related to the conservation and preservation of natural resources by researching
   A. A natural resource is something, such as a forest, a mineral deposit, or fresh water that is found in nature and is necessary or useful to humans.
   B. Conservation is the protection, preservation, management or restoration of natural environments and the ecological communities that inhabit them. Conservation is generally held to include the management of human use of natural resources for current public benefit and sustainable social and economic utilization.
   C. Preservation is to keep alive or in existence

VIII. List characteristics of quality presentations
   A. Components of effective, nonverbal communication
      1. Eye contact: direct, visual contact with every person or group of people for three to give seconds
      2. Gestures: add impact and clarity
      3. Movement/Posture: displays confidence
      4. Facial Expressions: show your emotions
   B. Creating an outline
      1. Presentation Title
      2. Topic area/what it is or means
      3. list at least three facts about the topic
<table>
<thead>
<tr>
<th>Course</th>
<th>Exploring Agricultural Science</th>
<th>Agriculture Issues</th>
</tr>
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</table>

**Essential Standard:**
9.00 12% B2 Understand the current issues impacting the agricultural industry

**Objective:**
9.01 6% B2 Recognize issues impacting the agricultural industry

**Sources of Information:**
- Middle School Food and Agricultural Literacy Curriculum – National FFA
- National Agriculture in the Classroom; agclassroom.org
- FFA New Horizons; www.ffa.org

**Suggested Activities 9.01**

<table>
<thead>
<tr>
<th>Activity Number</th>
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| 9.01.01 | Issues Beware  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.02 | Plants Have Issues Too – Issues Related to Plant Production  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.03 | Prime Rib Please! – Issues Related to Animal Production  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.04 | Identifying Agriculture Issues  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.05 | Evaluating Sources of Agriculture Issues  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.06 | Evaluate Current Agriculture Issues  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.07 | Agriculture Issues in Animal Agriculture  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.08 | Issues in Conserving Natural Resources  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.09 | Presenting on Agriculture Issues  
Middle School Food and Agricultural Literacy Curriculum |
| 9.01.10 | Water Quality  
FFA New Horizons; 2019 Spring Edition Teaching Guide |
<table>
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<th>COURSE</th>
<th>EXPLORING AGRICULTURAL SCIENCE</th>
<th>AGRICULTURE ISSUES</th>
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<tr>
<td>OBJECTIVE:</td>
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<td>Explain the economic impact of agricultural issues and the roles of advocacy</td>
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</table>

Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA

Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.

I. Current issues impacting the agricultural economy
   A. Cause and effect relationship
      1. A direct relationship between an action and a result
      2. Example – summer and winter clothing, flip flops
   B. Supply and Demand
      1. When demand is high, the market tries to match demand with the amount supplied
      2. When demand is low, the market tries to match demand with the amount supplied
   C. Current issues impacting agriculture economy
      1. Technology: genetic engineering as it relates to gains in productivity and farmers’ incomes
      2. Global population: as the population increases so does the demand for food supply
   D. Land use and availability
      1. Uneven land distribution
      2. Urbanization or development

II. Economic impact of agriculture issues
   A. Trends
      1. The general course or prevailing tendency
      2. Style
   B. Supply
      1. A quantity of something on hand or available
      2. The quantity of a commodity that is in the market and available for purchase or that is available for purchase at a particular price.
   C. Demand
      1. The desire to purchase, coupled with the power to do so
      2. The quantity of goods that buyers will take at a particular price

III. Using math to understand the economic impact of agricultural issues
    A. Profit: returns, proceeds, or revenue, as from property or investments
B. Income: the monetary payment received for goods or services, or from other sources, as rents or investments

C. Expense: cost or charge

IV. Economic impact of a disease outbreak or product recall on the agricultural industry

A. Disease: a harmful deviation from the normal structural or functional state of an organism

B. Outbreak: A sudden increase

C. Disease Outbreak: a sudden increase of a harmful deviation from the normal structural or functional state of an organism

D. Historical and recent disease outbreaks
   1. Black Plague
   2. The Bird Flu
   3. Mad Cow Disease
   4. Swine Flu (H1N1)

E. Recall: to call back, summon to return
   1. Peanut butter
   2. Spinach
   3. Dog Food
   4. Toys made in China with lead paint
   5. Baby car seats

F. Economic impact of disease outbreaks or product recalls
   1. Media frenzy
   2. Huge economic losses
   3. Loss of consumer confidence
   4. Increased restrictions

V. Role of an advocate

A. Advocacy: giving aid to a cause

B. Methods of advocacy
   1. E-mail
   2. Personal letter
   3. Phone Call
   4. Webpage
   5. Newspaper Article
   6. Blog
   7. Presentation
   8. TV Advertisements

VI. Advocacy in Agriculture

A. Important events in the history of the American Farm Bureau
   1. Established in 1919 to further extension education efforts and provide information to farmers and consumers
   3. Influential in creating the 1933 Agriculture Adjustment Act, which increased farm loans and provided funds to stop farm foreclosures.
   4. Developed a soil conservation plan in 1935 to prevent overproduction of crops
5. Pushed to open exports during World War II as many countries suffered extensive damage to farmland during the war

B. Current concerns of American agriculture
   1. Global trade
   2. Concern for the environment
   3. Providing a safe and efficient food supply
   4. Animal welfare
   5. Providing accurate information to the American public about agriculture
## COURSE EXPLORING AGRICULTURAL SCIENCE AGRICULTURE ISSUES

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<td>Explain the economic impact of agricultural issues and the roles of advocacy</td>
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### SOURCES OF INFORMATION:
- Middle School Food and Agricultural Literacy Curriculum – National FFA
- National Agriculture in the Classroom; agclassroom.org

### SUGGESTED ACTIVITIES 9.02

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<th>Source</th>
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<td>Economic Impact of Agriculture Issues</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<tr>
<td>9.02.02</td>
<td>Economic Impact of Agriculture Issues</td>
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<td>9.02.03</td>
<td>Using Math to Understand the Economic Impact of Agricultural Issues</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>9.02.04</td>
<td>Breaking Away from the Frenzy</td>
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<td>9.02.05</td>
<td>The Role of an Advocate</td>
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<td>9.02.06</td>
<td>Advocacy in Agriculture</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>9.02.07</td>
<td>Filling the Global Grocery Bag</td>
<td>National Agriculture in the Classroom; agclassroom.org</td>
</tr>
</tbody>
</table>
I. Animal welfare vs. Animal rights
   A. Animal rights – a philosophical view that animals have rights similar to or the same as humans.
      1. True animal rights proponents believe that humans do not have the right to use animals at all.
      2. Animal rights proponents wish to ban all use of animals by humans.
      3. support law and regulations that would prohibit:
         a. rodeos
         b. horse racing circuses
         c. hunting
         d. life-saving medical research using animals
         e. raising of livestock for food
      4. Organizations that support animal rights
         a. Humane Society of the United States
         b. People for the Ethical Treatment of Animals
   B. Animal welfare – as defined by the American Veterinary Medical Association, is a human responsibility that encompasses all aspects of animal well-being
      1. Animal welfare supporters believe animals should be given proper housing, management, disease prevention and treatment, responsible care, humane handling, and, when necessary, humane euthanasia
      2. Animal welfare supporters:
         a. improve the treatment and well-being of animals based on research
         b. believe that humans can interact with animals if the proper care and management for all animals is involved
         c. use science to determine effective care and safe handling procedures
      3. Organizations that support animal welfare
         a. American Society for the Prevention of Cruelty to Animals
         b. Ducks/Quail Unlimited
         c. National Wild Turkey Federation
         d. World Wildlife Fund

Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA

Note to teacher: Create guided notes, PowerPoint’s or visual presentations for unpacked content.
II. Common myths about animal agriculture

A. Myth: Farmers care less for their animals than they do for the money animals ring them. Agribusiness corporations mislead farmers into using production systems and drugs that mean profits at the cost of animal welfare.

1. Facts
   a. Farmers and ranchers are neither cruel nor naïve. One of the main reasons someone goes into farming or ranching is a desire to work with animals.
   b. A farmer would compromise his or her own welfare if animals were mistreated.
   c. Agriculture is very competitive in the United States. It’s a career that pays the farmer a slim profit on the animals he cares for.
   d. Farmers are always looking ways to improve their farms to ensure animal welfare and the economics of production. It is in the farmer’s own best interest to see the animals in his charge treated humanely, guaranteeing him a healthy, high quality animal, a greater return on his investment, and a wholesome food product.
   e. No advertising campaign or salesman can convince a farmer to use a system or product that would harm an animal.

B. Myth: Farming in the United States is controlled by large corporations that care about profits and not about animal welfare.

1. Facts
   a. Of the 2.2 million farms in the United States, 87 percent are owned by an individual or a married couple responsible for operating the farm. If partnerships – typically a parent and a one or more children or other close relatives – are added to this total, 97 percent of the U.S. farms are family-owned and operated, according to the U.S. Department of Agriculture (USDA.)
   b. Even those farms that are legally corporations are generally family controlled, with USDA reporting only 7,000 non-family-controlled corporate farms in the United States.

C. Myth: Farm animals are routinely “mutilated” by beak trimming, tail docking, branding, dehorning, castration, and other practices to make it easier for the farmer.

1. Facts
   a. To the inexperienced viewer, some routine farm animal handling practices necessary to the welfare and health of the animal and the insurance of quality food may appear brutal, just as some lifesaving human surgical and medical practices may seem brutal to the casual observer.
b. All of these practices are done in a professional manner to ensure the welfare of the animal.

D. Myth: Care-free and free-range hens are healthier and require little or no drugs or medicines.
   1. Facts
      a. Cage-free and free-range hens require continuous medicated feed for some diseases and often require more drugs than caged hens because of their constant exposure and contact with litter and waste on barn floors.
      b. Hens in cage systems seldom require drugs and only receive medicines or drugs for therapeutic reasons. In fact, hens kept in care-free, organic, or free-range systems have higher rates of mortality than those kept in cage production systems.

E. Confinement operations – operating systems where animals are confined to buildings or cages
   1. Some animal welfare supports say;
      a. Pigs spend their entire lives in cages
      b. Sows are kept in farrowing crates
      c. Laying hens are kept in cages
   2. Animal producers say:
      a. Facilities are designed for animal safety
      b. They consider needed animal space
      c. Farrowing crates are designed to prevent sows from laying on piglets
      d. Easier to monitor animal health and treat animals accordingly

III. Programs that are designed to ensure the welfare of animals and prevent abuse or mistreatment
A. Animal Agriculture Alliance
   1. Food & Water
   2. Health & Veterinary Care
   3. Environment
   4. Husbandry Practices
   5. Handling
   6. Transportation
B. Society for the Prevention of Cruelty to Animals
   1. Raises awareness of the abuse of animals
   2. Teaches and fosters good parenting practices
   3. Promotes spay and neuter programs
   4. Goal to eradicate the need to euthanize healthy and adoptable companion animals
C. State-Based Animal Identification System
   1. To protect the health of U.S. livestock and poultry and the economic well-being of those industries
   2. When a disease outbreak occurs, animal health officials need to know:
      a. Which animals are involved in a disease outbreak
      b. Where the infected animals are currently located
c. What other animals might have been exposed to the disease

IV. Role of livestock production and show animals in relation to animal welfare concerns

1. Negative aspects of showing livestock:
   a. Holding feed/water to make weight
   b. Stress
   c. Drench gun, etc
   d. Physical alteration

2. Positive aspects of showing livestock:
   a. Show animals are fed the highest quality feed available. In many cases it’s more expensive, specific, and better balanced than the diet of the owner feeding the animal.
   b. Constant care and attention – show animals are worked with multiple times per day
   c. Climate controlled environment – kept in air-conditioned or well-ventilated barns
<table>
<thead>
<tr>
<th>COURSE</th>
<th>EXPLORING AGRICULTURAL SCIENCE</th>
<th>AGRICULTURE ISSUES</th>
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<tr>
<td>ESSENTIAL STANDARD:</td>
<td>9.00 12% B2</td>
<td>Understand the current issues impacting the agricultural industry</td>
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<tr>
<td>OBJECTIVE:</td>
<td>9.03 3% B2</td>
<td>Understand animal welfare and animal rights in production and showing of animals</td>
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**OBJECTIVE:**

Sources of Information:
Middle School Food and Agricultural Literacy Curriculum – National FFA
National Agriculture in the Classroom; agclassroom.org

### Suggested Activities 9.03

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<th>Description</th>
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<td>9.03.01</td>
<td>Rights vs. Welfare</td>
<td>Middle School Food and Agricultural Literacy Curriculum</td>
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<td>9.03.02</td>
<td>Who is Taking a Stand</td>
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<td>9.03.03</td>
<td>Get the Facts Straight</td>
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<td>Controversy in Showing and Raising Livestock</td>
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<td>9.03.06</td>
<td>You Decide</td>
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<td>9.03.07</td>
<td>Built it Better</td>
<td>National Agriculture in the Classroom; agclassroom.org</td>
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<td>9.03.08</td>
<td>Farmland</td>
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