



## Texas Cotton Lesson

Audience: 9-12 Agricultural Science Students

Lesson Length: Three to Four Weeks Combined with instruction and activities (pace depends on each classroom)

### Objectives:

- Students will develop an understanding of the phases of cotton production
- Students will exercise research and communication skills to gather information and draw conclusions
- Students will engage in career exploration

### TEKS Alignment:

- Principles of Agriculture, Food, and Natural Resources
  - 1.A, 1.B, 1.E, 6.A, 6.B, 7.B, 9.B, 9.C, 10.A, 11.D
- Advanced Plant and Soil Science
  - 1.A, 1.D, 2.A, 3.H, 6.A, 6.B, 9.F, 15.D, 18.A

### Part 1: Planting

- In general, cotton is a drought-resistant crop, meaning it can thrive without an abundant water source, which makes it a good crop for the dry Texas climate in much of the state.
  - Show a map of Texas and ask if students are familiar with where cotton is grown in Texas. Challenge students to discuss why (i.e. what they know about the climate in those areas, etc.) they either know or think these things.
- Planting time varies depending on the location.
  - Utilize this [site](#) for an overview of the cotton producing regions of Texas.
- Planting requires a good awareness of the environmental conditions. For example:
  - Temperature
    - Freezing conditions
    - Soil temperature
  - Moisture/rain
  - Soil viability
  - Length of growing season

Farmers utilize soil testing before planting to determine the soil viability and nutrient needs.



Activity 1:

- Have groups of students research how/where to send soil for testing. Students should consider contacting the local Texas A&M AgriLife Extension office to further learn about and discuss this process. It is highly encouraged for students to also speak with a cotton farmer to learn more about why soil testing is important from his/her perspective.
  - Students should determine what soil testing reveals about the soil – what components are ideal for the soil to include when growing cotton (or all crops). Students should gather this information during their research on the soil testing process.
- Once students research the process, allow students to test the soil around the school or school garden (if the school has one). Or, coordinate with a local farmer to test his or her soil. Students should properly prepare the soil sample to be sent for testing. As a class, submit a soil sample for testing and analyze the results upon receipt.
  - Once the soil sample testing results are received, students should make conclusions and record a summary of their conclusions on the below “Soil Testing Conclusions and Summary” document.
- Facilitate a discussion with the class about what each group learned and what next steps might be. Did they learn anything new about the importance of soil testing? If so, what?



Photo 1: Example of soil sample using a sampling rod



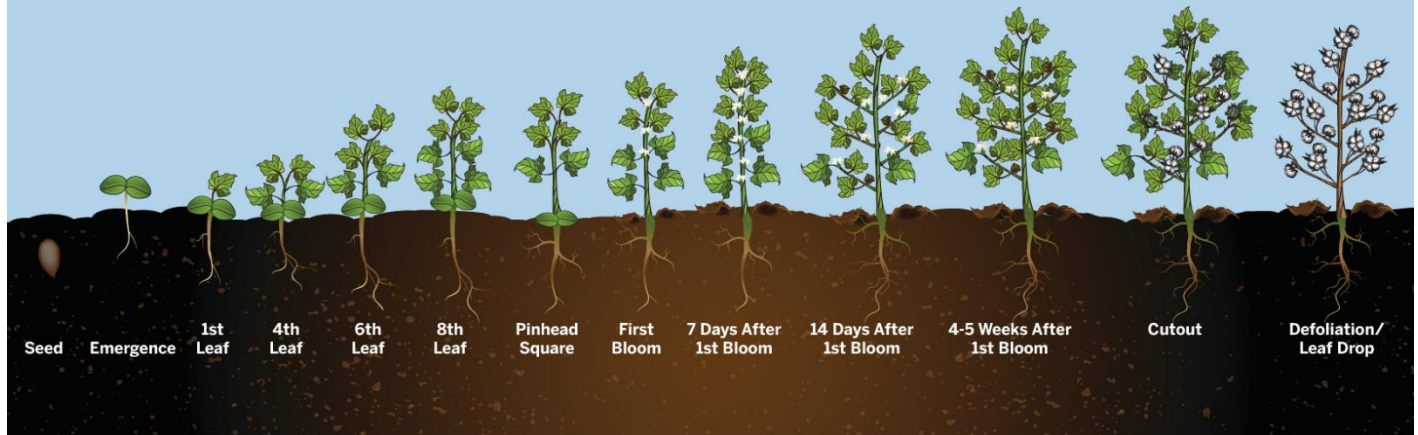
Photo Courtesy of Rachel Stoltzmann

## Part 2: Growing Cycle

- Stages of Growth: (Source: National Cotton Council of America: <https://www.cotton.org/tech/ace/growth-and-development.cfm>).
- 1. Germination and emergence
- 2. Seedling establishment
- 3. Leaf area and canopy development
- 4. Flowering and boll development
- 5. Maturation (open boll)



## STAGES OF COTTON PLANT GROWTH



- During the plant's growing cycle, one of the most important things to monitor is weed growth that competes for the nutrients in the soil that the cotton plant needs. Weeds are the most common issue present throughout the growing cycle; however, pests can also be present at different growing stages.
  - Weed management options to consider:
    - [This](#) document further discusses the below techniques.
      - Preventative (i.e. pre-emergent spraying or stocking ratio of livestock)
      - Cultural (i.e. prescribed fire)
      - Mechanical (i.e. mowing, shredding, or plowing)
      - Biological (i.e. grazing livestock)
      - Chemical (i.e. herbicide)
  - The most common weeds found in Texas cotton fields are provided [here](#) ("Cotton Weed Control" document). Photos are also included. Have students study the document independently, then facilitate a discussion to go over what they learned while reading.
    - Provide weed samples if you're able to.
  - To deal with a weed problem (or infestation), farmers must first identify the weed that is causing the problem. Often, a dichotomous key is used to determine weed identity.



- Practice this process utilizing the following presentation courtesy of the National Agriculture in the Classroom Matrix: <https://prezi.com/ha-sf9j0ehkn/classified-crop-case-files/>.
- If you were able to bring in weed samples, have students analyze and identify the weeds. Students might even use digital microscopes for an in-depth analysis.
- Weeds are managed through a variety of methods (see above), but when needed, farmers can and sometimes have to manage weeds with a responsible chemical program. Refer to the “Cotton Weed Control” document (linked above) from Texas A&M AgriLife Extension to learn about chemical use

#### Activity 2:

- Study a chemical program – students should speak to two farmers about their responsible chemical program and how technology such as drones and other imaging helps them identify issues in their fields. How does technology help and what limitations does such technology have? \*Utilize the “Interview Notes” document below.
  - \*NOTE: This can be a virtual meeting that the students set up and coordinate if an in-person meeting is not feasible)
- Ask students: Based on your conversations and knowledge gained from other research, what should your first step be when developing a chemical program to control weeds? (i.e. identify the issues, location of issue, identify the weeds, etc.)
  - **Sample Chemical Program Activity:** Have students create a sample chemical program based on the below information. Students should display their sample program in a PowerPoint or other creative outlet.

Mr. Smith farms cotton in Central Texas. After checking his fields, Mr. Smith noticed a weed issue in one of his fields. The issue is not present throughout the entire field; rather, the issue only seems to be present in three locations around the perimeter. To date, Mr. Smith has not utilized a consistent chemical program. It is June. What might the problematic weed be? Based on this information and what you learned through research, develop a plan to help Mr. Smith combat the weed problem from now until harvest. Your plan should also include a chemical program that Mr. Smith could follow during the next growing season (start to finish).



### Part 3: Harvesting

- A cotton field is harvest ready when the leaves have been defoliated
  - Defoliated means the leaves are removed from the stalk of the plant
- Defoliation occurs either naturally (a freeze) or through the use of a chemical harvest aid
- Harvest aid is sprayed on the plant to help it defoliate at a more rapid pace. Cotton is a perennial plant, so it would grow into a tree if a freeze didn't occur or harvest aid wasn't used
  - The use of chemical harvest aid is region specific
- The government regulates cotton stalk destruction as part of the boll weevil eradication efforts
  - The Boll Weevil is a major pest that feeds on the flowers and cotton buds
  - Cotton stalk destruction is required in some areas to help control the boll weevil
  - Cotton stalk destruction occurs naturally (freeze), mechanically (plowing/tilling) or chemically (harvest aid herbicide)
  - Source: [Cotton Stalk Destruction with Herbicides](#)
  - State regulated and the destruction date depends on the region/zone
    - Texas Department of Agriculture Cotton Stalk Destruction Zones: <https://www.texasagriculture.gov/RegulatoryPrograms/CottonStalkDestruction.aspx>
    - Some counties are not in a zone due to the colder climate where it freezes; therefore, stalk destruction isn't required because the freeze prevents regrowth
- Cotton harvesting techniques:
  - There are two different cotton harvesters used to harvest cotton out of the field. See page four of the following document for information about each technique: <http://agrillife.org/aes/files/2010/06/Crop-Profile-for-Cotton-in-Texas2.pdf>.
    - 1. Cotton Stripper
    - 2. Cotton Picker

### Activity 3:

- Divide the class into groups
- Assign each group a Texas county
- Each group should identify the cotton stalk destruction zone that the county is in (if the county is in a zone)
  - If the county is not in a zone, why not?
- Once students identify the zone, research the specific harvest details for that county (i.e. harvest date, harvest aid or no harvest aid, harvest technique,



- average yield for that area, and other information the group feels is interesting and pertinent to growing cotton in that area)
- Students will create a creative 3-minute educational video that could be used in a public setting to teach about cotton production in the area that they researched

#### Part 4: Ginning

- Test your students' knowledge by asking the following questions.  
You can utilize the following Nearpod quiz to facilitate these questions if you choose: <https://np1.nearpod.com/sharePresentation.php?code=277d7c5b699059d4ad9175b2e79c64f3-1>. Create a free Nearpod account if you do not already have one. Students will join via [join.nearpod.com](https://join.nearpod.com) and utilize the access code one you select (via the above link) the "live-participation" mode. If you choose not utilize the Nearpod quiz, utilize slide 21 of the PowerPoint. Delete slide 20 if you choose to use the Nearpod quiz.
  1. Who invented the cotton gin? (Answer: Eli Whitney)
  2. What year was the cotton gin invented? (Answer: 1794)
  3. Where (city and state) is the largest cotton gin in the United States located? (Answer: Spearman, Texas)
  4. What is the fiber called that is left on the seed once the majority of lint is removed during the ginning process? (Answer: Linters)
  5. True or False: The cotton gin cleans the cotton AND separates the lint from the seed. (Answer: cleans the cotton and removes the lint from the seed)
  6. True or False: Cotton seed is used to feed cattle? (Answer: True)
  7. Some of the foods we eat contain cotton seed oil as an ingredient. Which of the following foods contains cotton seed oil? (Answer: All of the Above)
    - a. Peanut Butter
    - b. Milano Cookies
    - c. Cream of Mushroom Soup
    - d. All of the Above
- Show the following video that highlights the Adobe Walls Gin in Spearman, TX, the largest gin in the United States: <https://www.youtube.com/watch?v=geX8ItKJD9o>
- Read about the ginning process [here](#)
- Ginning Steps:
  - Step 1: Module arrives from the field to the cotton gin
  - Step 2: Cotton is dried to decrease the amount of moisture (improves fiber quality)
  - Step 3: Cotton is cleaned to remove other objects such as limbs, leaves, etc. (improves fiber quality)



- Step 4: Cotton moves to gin stands where the seeds are separated from the lint using circular saws
- Step 5: The lint is then pressed into large bales that weigh about 500 pounds
- Step 6: A sample is taken from each bale to grade the cotton to determine quality, which plays a role in how the farmer is paid
- Step 7: After the entire process takes place, the bale of cotton is stored in a warehouse until it is shipped to its next destination
- Play the following ginning video for students to see the steps in the ginning process
  - <https://vimeo.com/711842197/ed91274a43>
- \*Ask students to think critically when answering the following question. **What careers do you see, not see (i.e., those who might work behind the scenes or not directly in the gin), and think of when you watched the video that play a role in getting the cotton from the field to the store?** Make a list on the board as students share their thoughts and engage in discussion.
  - Examples:
    - Farmers
    - Coders
    - Truck drivers
    - Inspectors
    - Laboratory technicians
    - Gin workers
    - Gin manager
  - Show students the career cluster handout.

#### Activity 4

Groups of students should pick a career, research that career, and give a presentation to the class as if they work for the human resource department of a company hiring for this position. The students should role play and present why this job is one someone should consider. *\*The following information must be provided, but students are encouraged to be creative and provide all the information about the role and the company that might be of interest to a qualified candidate.*

- Career:
- Education Requirements:
- Salary/Pay:
- Location:
- What is an employer looking for (i.e., expectations) in a person who fulfills this role?
- How does the farmer get paid?
  - Farmers must wait on the cotton to be ginned and graded before being paid.





- The farmer's pay is dependent on the grade of the cotton – each bale of cotton is graded in a USDA laboratory. The better the cotton grades, the more the farmer is paid.
- [This](#) document provides information about payment
- Where does the money go when we purchase food?
  - Note: The following activity isn't directly related to cotton, but it provides a glimpse into what share of the food dollar the farmer actually gets. One major misconception is that when food prices increase in the grocery store, the farmer gets paid more. This isn't necessarily the case. For example, if fuel prices go up and cause an increase in food prices, farmers and ranchers do not benefit from the food price increase. How do you know about specific brands of food? The brands behind your favorite syrup, cereal, or ice cream use advertising to promote and garner interest from consumers, retailers, and purchasers in the restaurant industry. Advertising costs play into the price of food for the consumer and others. There are multiple different occupations and job opportunities available in getting the food from the farm to the grocery store or restaurant supplier.

#### Activity 5

- Utilize the following digital Nearpod matching activating OR the cards below to facilitate a matching game with the students. Nearpod Matching Activity: <https://np1.nearpod.com/sharePresentation.php?code=2fd79c4ac13ccc0b16edca61e342b519-1>. Create a free Nearpod account if you do not already have one. Students will join via join.nearpod.com and utilize the access code one you select (via the above link) the "live-participation" mode. If you choose not to utilize the Nearpod quiz, utilize the below cutouts and delete slide 30 of the PowerPoint.

Instructions: Cut the cards out and have groups of students match the amount of the food dollar with the correct industry. The correct answers are below.

- Finance & Insurance: 3.3 Cents
- Transportation: 4.1 Cents
- Advertising: 2.9 Cents
- Farm Production: 8 Cents
- Food Processing: 16.7 Cents
- Food Services: 27.9 Cents
- Wholesale Trade: 11.9 Cents
- Retail Trade: 14.2 Cents



**Soil Testing Conclusions & Summary**

**\*Worksheet should be added to other notes that are taken throughout all parts of the lesson**

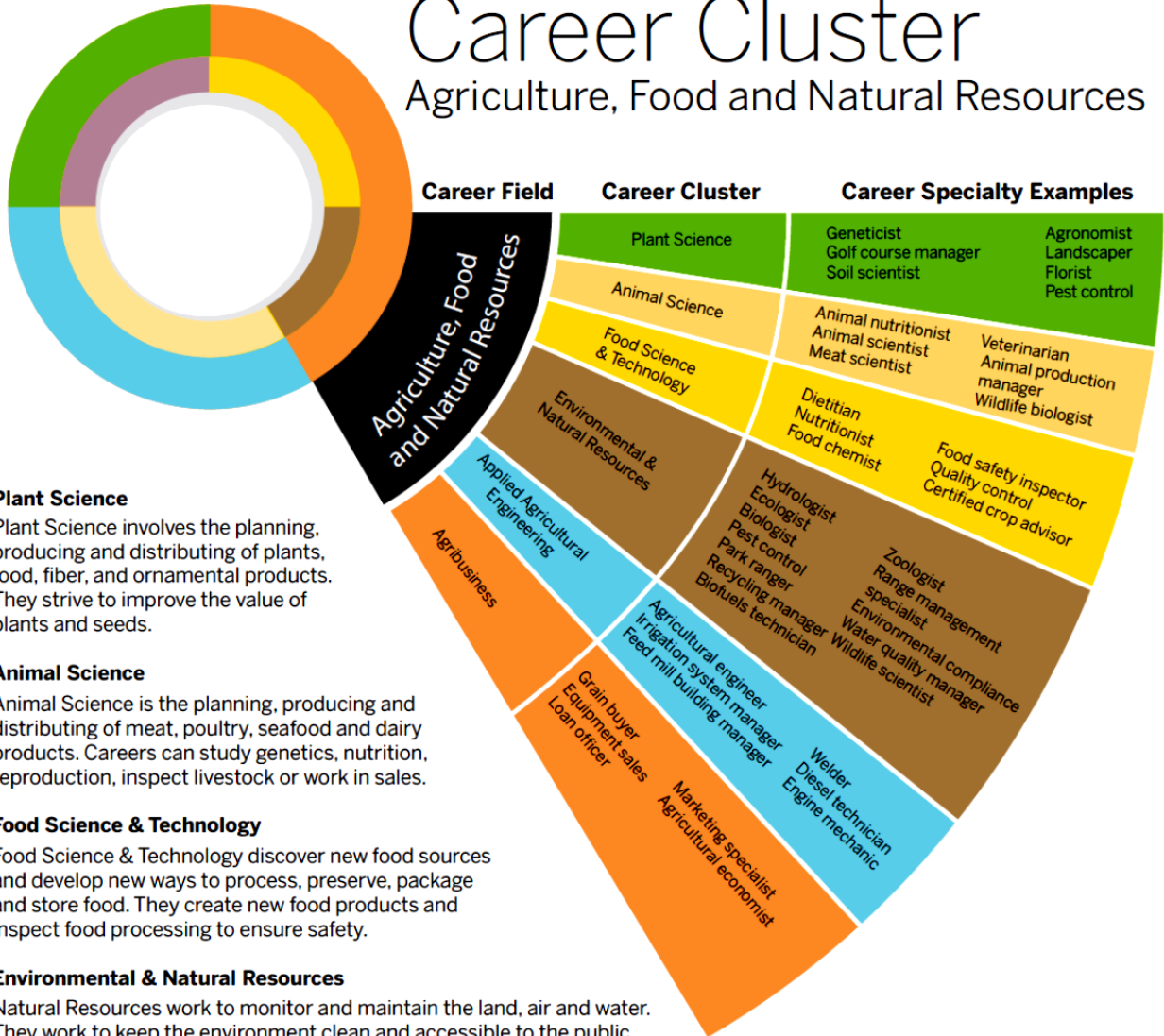
**Conclusion/s:**

**Summary:**



# Career Cluster

## Agriculture, Food and Natural Resources



### Plant Science

Plant Science involves the planning, producing and distributing of plants, food, fiber, and ornamental products. They strive to improve the value of plants and seeds.

### Animal Science

Animal Science is the planning, producing and distributing of meat, poultry, seafood and dairy products. Careers can study genetics, nutrition, reproduction, inspect livestock or work in sales.

### Food Science & Technology

Food Science & Technology discover new food sources and develop new ways to process, preserve, package and store food. They create new food products and inspect food processing to ensure safety.

### Environmental & Natural Resources

Natural Resources work to monitor and maintain the land, air and water. They work to keep the environment clean and accessible to the public. Environmental Resources work to preserve the environment by keeping it clean and accessible to the public.

### Applied Agricultural Engineering

Applied Agricultural Engineering helps to design and maintain machinery used in agriculture by applying knowledge of engineering, hydraulics, electronics, power and structures. They develop ways to help conserve soil and water and improve agricultural products.

### Agribusiness

Agribusiness uses technology to coordinate all activities that contribute to production, processing, marketing, distributing, financing and development of all agriculture commodities. They help to increase efficiency and profitability by using spreadsheets, satellite systems and other innovations.





<b>Plant Science</b>			
<b>High School or On-the-Job Training</b>	<b>Associate's Degree</b>	<b>Bachelor's Degree</b>	<b>Master's/Doctoral Degree</b>
Nursery or greenhouse worker Seed sales Crop inspectors	Commercial horticulture Crop production Forestry Landscape/nursery	Conservationist Plant protection science Arboretum manager Sustainable designer	Agronomy consultant Biochemist Entomologist Horticulture specialist
<b>Animal Science</b>			
<b>High School or On-the-Job Training</b>	<b>Associate's Degree</b>	<b>Bachelor's Degree</b>	<b>Master's/Doctoral Degree</b>
Animal caretakers Feed sales Animal trainer Farmer/rancher Artificial inseminator	Equine industry management Livestock industry management Swine management Vet technician	Grazing livestock systems Animal inspector Feedlot manager Food safety inspector	Geneticist Animal nutritionist Biochemist Integrative biomedical sciences Veterinary medicine
<b>Food Science &amp; Technology</b>			
<b>High School or On-the-Job Training</b>	<b>Associate's Degree</b>	<b>Bachelor's Degree</b>	<b>Master's/Doctoral Degree</b>
Butcher Meat processor Inspector Baker	Quality control USDA grader	Hospitality, restaurant and tourism management Mechanized systems management Meat sales/buyer Research and development Auditor	Food science and technology nutrition Meat scientist Test kitchen manager
<b>Environmental &amp; Natural Resources</b>			
<b>High School or On-the-Job Training</b>	<b>Associate's Degree</b>	<b>Bachelor's Degree</b>	<b>Master's/Doctoral Degree</b>
Emergency response technician Wildland firefighter Recycling manager	Soil and water conservationist Laboratory science technician Campground manager Wetlands specialist	Environmental studies Aquatic ecologist Texas Parks and Wildlife Soil scientist Zoologist Water quality manager Park Ranger	Wildlife biologist Regulatory entomologist Natural resources scientist Urban planner
<b>Applied Agricultural Engineering</b>			
<b>High School or On-the-Job Training</b>	<b>Associate's Degree</b>	<b>Bachelor's Degree</b>	<b>Master's/Doctoral Degree</b>
Ag service trainee Ag equipment operator Electrician apprenticeship Plumbing apprenticeship Welding apprenticeship	Farm mechanics Irrigation technology Mechanized agriculture practices	Mechanized marketing Mechanized science Processing operations Electrical engineer	Agricultural and biological systems engineer Mechanized systems management
<b>Agribusiness</b>			
<b>High School or On-the-Job Training</b>	<b>Associate's Degree</b>	<b>Bachelor's Degree</b>	<b>Master's/Doctoral Degree</b>
Ag business clerk Ag warehouse worker Farmer/rancher	Ag sales Custom applicators Farm and ranch business management	Commodity trader Government agency employee Loan officer	Attorney/lawyer Political consultant Ag economist



**Interview Notes**

**\*Worksheet should be added to other notes that are taken throughout all parts of the lesson**

A large, empty rectangular box with a dashed border, intended for taking interview notes.



**The Food Dollar Breakdown: Where does the money go?**

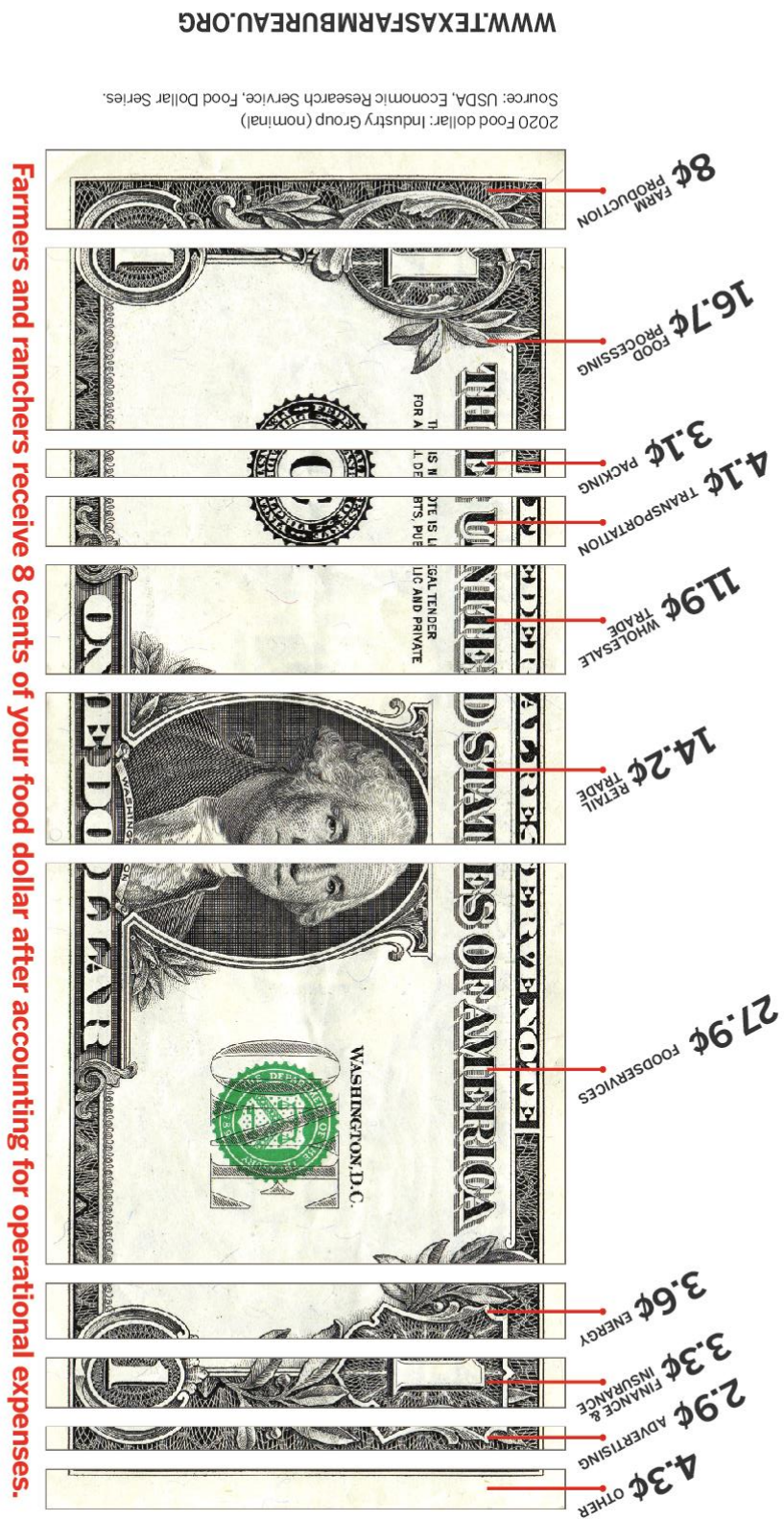
**Matching Activity**

Teacher Instructions: Make several copies of these pieces, and have groups match the percentage of the breakdown with the corresponding industry.

<b>16.7 Cents</b>	<b>3.3 Cents</b>	<b>Advertising</b>
<b>27.9 Cents</b>	<b>11.9 Cents</b>	<b>Farm Production</b>
<b>4.1 Cents</b>	<b>14.2 Cents</b>	<b>Food Processing</b>
<b>2.9 Cents</b>	<b>Finance &amp; Insurance</b>	<b>Food Services</b>
<b>8 Cents</b>	<b>Transportation</b>	<b>Wholesale Trade</b>
	<b>Retail Trade</b>	



# What is the breakdown of the food dollar?



Source: USDA, Economic Research Service, Food Dollar Series.  
2020 Food dollar: Industry Group (nominal)  
WWW.TEXASFARMBUREAU.ORG

Farmers and ranchers receive 8 cents of your food dollar after accounting for operational expenses.