

FROM  
START-TO-FINISH:

# PRODUCING, PREPARING, & PRESERVING

CALIFORNIA SPECIALTY CROPS  
**IN THE** CLASSROOM

STUDENT GUIDE

**Learn  
About Ag**  
California Foundation for  
Agriculture in the Classroom

# Agriculture and You!

## HAVE YOU EVER STOPPED TO THINK ABOUT WHERE YOUR LUNCH COMES FROM?

Not the cafeteria or your refrigerator at home, but where it **really** comes from? Your apples and grapes? Your chicken nuggets and string cheese? What is your t-shirt made of? Your sweater? Your favorite pair of jeans? What about the paper you write on, the books you read, and the room you're sitting in?

These things are linked together, and linked to you through the amazing and diverse agriculture industry. Agriculture is the work of farmers and ranchers who are responsible for producing the supply of food, clothing, and shelter that we need daily.

This activity book is designed to dig deeper into the agricultural concepts you've been learning about in your classroom. You may be able to complete the activities independently, but don't hesitate to invite an adult to learn more about agriculture alongside you.

For related videos and educational resources, visit [www.LearnAboutAg.org/StartToFinish](http://www.LearnAboutAg.org/StartToFinish).

### TABLE OF CONTENTS:

Lesson 1: Get Growing.....	Page 3
Lesson 2: Tasty Testing.....	Page 9
Lesson 3: Preserving the Powerful Pepper .....	Page 16
Additional Resources .....	Page 21



#### Passive Peppers

CCSS.ELA-LITERACY.L.8.1.B: Form and use verbs in the active and passive voice.

#### Keep It Snappy

NGSS.MS-LS1-5: Construct a scientific explanation based on evidence for how environmental and genetic factors influence the growth of organisms.

NGSS.MS-SEP-6: Construct an explanation that includes qualitative or quantitative relationships between variables that predict(s) and/or describe(s) phenomena.

#### A Savory Sum

CCSS.MATH.CONTENT.5.MD.A.1: Convert among different-

sized standard measurement units within a given measurement system (e.g., convert 5 cm to 0.05 m), and use these conversions in solving multi-step, real world problems.

CCSS.MATH.CONTENT.6.RP.A.3: Use ratio and rate reasoning to solve real-world and mathematical problems, e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations.

CCSS.MATH.CONTENT.7.RP.A.3: Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error.

## PRESERVING A LOST ART

# A NEW GENERATION TURNS TO OLD-FASHIONED PRACTICE OF PUTTING UP PRODUCE

Braeden Rappozo's jams have won blue ribbons and his dried fruit, jerky, and pickles have won the accolades of friends and family. All of this is impressive, especially considering he's only in the fifth grade.



Braeden wasn't always such an expert. In fact, there was a time when he was shocked to learn that dill pickles start life as cucumbers. "I thought it just came out like that!" he said with a laugh. "I thought you just grew pickles and pulled them out of the ground."

But thanks to the Junior Master Food Preserver Program offered by his local 4-H program, Braeden can now pickle, can, jam, and dehydrate with the best of them. "I like making my own foods because they're either just as good or they're way better than in restaurants," Braeden said. "It's a long process. But once it's finished, it's all worth it."

Braeden is among the youngest members of a broad group of home-kitchen enthusiasts who are returning to the art of putting up food. Hobbyists of all ages are forgoing the convenience of ready-made foods and opting for the satisfying practice of crafting their own pickles and jams, salsas and canned tomatoes, kimchee and kombucha.

Missy Gable, co-director of the UC Master Food Preserver Program, says a resurgence of interest in food preserving spiked around 2008 and shows little sign of waning. The roots of the trend might be found in the Great Recession, Gable said. The same period also saw an increase in home vegetable gardens, leading to an abundance of seasonal produce that needed to be preserved. Both gardening and preserving are perceived to be thrifty measures, though the cost savings don't always pencil out, cautioned Gable. These days, interest remains strong, but the emphasis has shifted to reviving the vintage appeal of home-crafted foods, eating more locally grown foods, and a desire to reduce our food's carbon footprint, Gable said.

Today's home food preservation, undertaken more often by choice than by necessity, doesn't look the same as when your grandmother did it, she said. Advancements in food science have taught us better practices and banished some questionable ones, such as using paraffin to seal jars. Recipes often explore a modern, multicultural palate, unusual flavor combinations, and a greater diversity of fruits and vegetables.

Preserving is also a way to extend the pleasure of California's bounty for certain seasonally fleeting items. Green beans are a warm-season vegetable that are highly perishable and easy to preserve by canning. Glass jars are filled with washed and trimmed green beans, boiling water, and a blend of spices before being placed in a pressure canner. A pressure canner is a heavy-duty piece of equipment with a vent, a pressure gauge, and screw clamps. Its temperature gets much hotter than boiling water, which kills unwanted microorganisms. Experts say this is the only safe method for canning vegetables low in acidity. The process only takes about 15 minutes, and the resulting produce—canned green beans—can be enjoyed throughout the winter months.

This article was reprinted with permission from the May/June 2017 edition of California Bountiful Magazine, a publication of the California Farm Bureau Foundation. Story by Shannon Springmeyer. Read it online at [californiabountiful.com](http://californiabountiful.com).

## READING COMPREHENSION QUESTIONS

READ THE INFORMATIONAL TEXT, *PRESERVING A LOST ART*. ANSWER THE QUESTIONS BELOW USING COMPLETE SENTENCES.

1. Why does Braeden like making his own food?
2. Give four examples of preserved foods that are mentioned in the text.
3. According to Missy Gable, when did home food preservation recently become popular?
4. Complete the t-chart using evidence from the text.

<i>Why food preservation was popular in the past</i>	<i>Why food preservation is popular now</i>

5. The author uses the phrase “seasonally fleeting.” Examine the text to determine the meaning of this phrase.
6. How have advancements in food science influenced preservation methods?
7. Why is a pressure canner used to preserve green beans?
8. The author used the phrase “putting up food.” Examine the text to determine the meaning of this phrase.
9. How might preserving our own food reduce our carbon footprint? Give at least two supporting arguments.

# Keep it Snappy

**THE BIG QUESTION:** What is the best way to store fresh green beans at home?

## Background:

How green beans are handled during and after harvesting directly effects quality and shelf life. In the field, pods are immediately cooled by refrigeration or drenching with cool water. At the grocery store, green beans are displayed in refrigerated cases in the produce aisle. At the farmer's market, green beans are kept under shade. In this activity, you will compare methods for keeping green beans fresh (and snappy) at home.

## Procedure:

1. Purchase approximately one pound of untrimmed green beans.
2. Determine a hypothesis. Based on what you know from both science and personal experience, what is the best method for storing fresh green beans at home? These methods may include variations in: temperature, air exposure, storage containers, cutting techniques, or washing beans with a preservative solution. Complete the sentence below:

If green beans are \_\_\_\_\_, then they will \_\_\_\_\_.

3. What variables can you use to test your hypothesis?
  - a. What variables can you measure or observe (dependent variables)?
  - b. What variables can you manipulate in an experiment (independent variables)? Select only one to test.
  - c. What variables must remain constant (control variables)?
4. What experiment could you use to test your hypothesis? Your experiment will likely require one control and several treatment groups with the same independent variable. List the materials and outline the methods you will use.
5. Conduct your experiment and make observations.
6. Consider the following questions:
  - a. How did your results differ between the control and treatment groups?
  - b. Did your results support or oppose your hypothesis?
  - c. What new hypothesis did your findings inspire?

**TRY THIS: COMPARE YOUR RESULTS WITH THE REST OF YOUR CLASS. DESIGN A BROCHURE THAT EDUCATES CONSUMERS ABOUT PROLONGING THE SHELF-LIFE OF GREEN BEANS AT HOME.**

# THE PLANTER CHALLENGE

## INTRODUCTION:

DESIGN AND BUILD A GREEN BEAN PLANTER THAT WILL MECHANICALLY DROP THREE OR MORE SEEDS ONTO A PIECE OF MASKING TAPE.

## ADDITIONAL PARAMETERS AND EXPECTATIONS:

- The seeds must be dropped by the machine
- The seeds must be dropped in intervals
- At least one simple machine must be employed
- You may only use the materials provided to the class

## BRAINSTORM AND DESIGN

*Look at your materials and think about the questions below. Then sketch your ideas in the space provided.*

1. How will the planter move down the row?

2. What's the best way to make a single seed drop?

3. How will you direct the seed onto the masking tape?

## DESIGN A GROUP PROTOTYPE

**COLLABORATE WITH YOUR GROUP. DETERMINE DESIGN ELEMENTS YOU WILL USE. SKETCH YOUR IDEAS IN THE SPACE BELOW.**

# BUILD, TEST, EVALUATE, AND REDESIGN

Use the materials to build your planter. Then test it by adding seeds and dropping them in a line. When you test, your design may not work as planned. When engineers solve a problem, they try different ideas, learn from mistakes, and try again. The steps they use to arrive at a solution is called the design process. Study the problems and then redesign.

## FOR EXAMPLE, IF...

### **Too many seeds come out—**

Engineers carefully consider force, how energy is applied and the resulting effect. Where could you apply force to select a single seed or perhaps reject the other seeds?

### **The seed lands out of place—**

Think about shapes that will create a more exact drop zone. Engineers use real world experiences to shape design solutions. Consider how we use common household items like funnels and straws.

### **The planter doesn't move easily—**

Revisit those simple machines we reviewed at the beginning of the lesson. Think about which simple machines might help something move over a flat surface. Engineers often use simple machines in even the most complex designs.

## DESIGN PROBLEMS

## OUR SOLUTIONS

## REFLECTION

1. What was most difficult about this challenge? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

2. Which simple machines did you use in your design? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

3. Why do farmers use machines to plant seeds? \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

# THE MATH CHALLENGE

---

**INTRODUCTION: FARMERS USE A SIGNIFICANT AMOUNT OF MATH IN THEIR DAILY OPERATIONS. SOLVE THE PROBLEMS BELOW. SHOW YOUR WORK AND INCLUDE UNITS IN YOUR ANSWERS.**



1. A farmer is planting a 47-acre field of green beans. How many seeds must be purchased if the farmer plants 140,000 seeds per acre?
2. Green bean seeds are sold in pounds. There are approximately 2,000 seeds per pound, depending on seed size. How many pounds should the farmer purchase?
3. The price of green bean seed is \$37.50 for a five-pound bag. How much will it cost to plant the entire field?
4. An acre is an area of land equivalent to 43,560 square feet. What is the area, in square feet, of the farmer's field?
5. There are 351 rows in the field. Each row is 1,400 feet long. The planter can plant three rows at the same time. How many miles will the tractor drive to plant the entire field? *Hint: There are 5,280 feet in one mile.*
6. If a tractor travels at 6 MPH, how long will it take to plant the entire field?

# Aromatic Crops Help Restaurants Thrive

FOR SOME CHEFS, IT'S THE SMALLEST INGREDIENT THAT MAKES THE BIGGEST DIFFERENCE.

What makes a good restaurant? Is it the location? Is it the chef? Is it the food?

Almost from the beginning of time, man has depended on fresh herbs for a variety of uses. Did you know rosemary was a symbol of fidelity for the ancient Greeks? And in medieval times, fennel was put in keyholes to keep out ghosts and evil spirits. During World War II, branches of rosemary were burned to keep germs from wounded soldiers. Today, herbs still have a variety of uses and here in California and many get their start at Jacobs Farm in Pescadero.



In 1980, Larry Jacobs started the farm with only one small row of tarragon. Today, it grows more than 200 different types of herbs and has become the largest organic herb grower in the country. The farm grows a wide variety, from the most popular—sage, thyme, and rosemary—to the more unusual—chervil, savory, and sorrel. Jacobs Farm herbs are sold throughout the United States and are a big hit with chefs, who love the fresh flavor of herbs to add spice to dishes without adding calories.

One of those chefs is Peter McNee. Executive chef at one of Sausalito's most popular restaurants, Poggio, Peter worked with owner Larry Mindel to start their own herb garden that would support the restaurant. They collaborated on a special idea: a hillside garden located a mere 100 yards from the restaurant. "Fresh herbs can't get any more fresh than that!" Peter said.

It seems fresh herbs are taking meals from the mundane to the magnificent for farmers and chefs alike. "The market has just gone through the roof. The growth we've experienced seems to show people are cooking with fresh culinary herbs and are doing more and more of it," Brendan Miele from Jacobs Farm said. "I depend on them. They're not just used for garnishes anymore," Peter said.



## **Sorrel**

Light, lemony, mildly tart, citrus flavor. These spinach-like leaves are a great accent to fish, eggs, and cream-based dishes. Chop and toss into salads, lightly sauté in butter with spinach, mince and fold into herb butter, or puree in soups and sauces. Try in richer dishes like potato and egg salads.



## **Savory**

Combination of pepper, clove, mint, and thyme flavors. Savory stands up well to marinades and its flavor lends itself to a diverse array of recipes. Excellent in white and black bean dishes and 5-bean chili, cheese sauces, risottos, chowders, and recipes featuring ground beef. Stands up to long cooking times.



## **Chervil**

Warm and delicate with flavors of parsley and celery. Chervil is favored in French cuisine, and flavors everything from vinaigrette and fish to gravies and egg dishes. Use as an accent for honey-buttered carrots, deviled eggs, or omelets. Chop and toss with goat cheese cubes for a quick hors d'oeuvre.

This content originally aired on October 21, 2011 as an episode of California Bountiful, a TV program produced by the California Farm Bureau Foundation. Written by Tracy Sellers and reprinted with permission. Read it online at [californiabountiful.com](http://californiabountiful.com).

## READING COMPREHENSION QUESTIONS

READ THE INFORMATIONAL TEXT, *AROMATIC CALIFORNIA CROPS HELP RESTAURANTS THRIVE*.  
ANSWER THE QUESTIONS BELOW USING COMPLETE SENTENCES.

1. Site one example of how herbs have been used in the past.
2. Who is Larry Jacobs, and why is he important to this text?
3. Who is Peter McNee, and why is he important to this text?
4. Identify at least one benefit of cooking with fresh herbs stated in the text.
5. What does aromatic mean? Use the text to support your definition.
6. What does chef Peter McNee mean when he says, “Fresh herbs can’t get any more fresh than that!”
7. What does mundane mean? Use the text to support your definition.
8. Why does Brendan Miele from Jacobs Farm believe that more people are cooking with fresh herbs?
9. Use evidence from the text to answer the question: What makes a good restaurant?
10. Which of the three herbs featured on the page would you like to try? Why?
11. Draw a picture of Poggio restaurant. Include details from the text.

# A Savory Sum

**THE BIG QUESTION:** What is the most cost-effective way to buy herbs for home cooking?

## Background:

Herbs are sold at grocery stores in two primary forms: dried and fresh. Dried herbs are typically sold in jars among spices in the baking aisle. Since fresh herbs require refrigeration, they are often sold in plastic clamshell containers in the produce section or as live plants. In this activity, you will analyze and compare the prices of dried and fresh herbs.

## Procedure:

1. Visit your local grocery store. Go to the fresh produce section. Record the total weight (in grams) and price for three different fresh herbs. For best results, choose herbs without a tough, woody stem (like rosemary). 1 ounce = 28.3495 grams

Herb	Total weight (grams)	Price

2. During the commercial drying process, fresh herbs lose approximately 80% of their weight from moisture loss. Find the equivalent dry weight of each fresh herb.

Herb	Dry weight (grams)

3. Determine the unit price by dividing the price by the dry weight of each fresh herb.

Herb	Unit price (price per gram)

Continued on next page →

4. Go to the dried herb section of your grocery store. Find the dried version of the three herbs recorded above.

Herb	Total weight (grams)	Price

5. Determine the unit price by dividing the price by weight of each dried herb.

Herb	Unit price (price per gram)

6. You now have unit prices for both fresh and dried forms of each herb. Consider the following questions:

- a. Which form is the most inexpensive?
  
  
  
  
  
  
  
  
  
  
- b. Were your results consistent among different herbs? Explain.
  
  
  
  
  
  
  
  
  
  
- c. What is the average difference in price between fresh and dried herbs?
  
  
  
  
  
  
  
  
  
  
- d. What other considerations might be important when deciding whether to purchase fresh or dried herbs?
  
  
  
  
  
  
  
  
  
  
- e. If you needed to purchase herbs for a cooking project, which form would you purchase? Give at least three reasons to support your choice.

**TRY THIS: COMPARE YOUR RESULTS TO ADDITIONAL FORMS OF HERBS SOLD AT THE GROCERY STORE, INCLUDING FRESH PASTES AND FROZEN PRODUCTS. MAKE A LIST OF CONSIDERATIONS THAT MIGHT INFLUENCE THE PURCHASE OF EACH FORM.**

## STUDENT TEXT:

# The wonderful world of herbs

The use of plants as herbs has been important to all cultures since long before history was recorded. Hundreds of tribal cultures have used wild and cultivated herbs for religious, medicinal, and food purposes for thousands of years.



Native to Arab countries near the Mediterranean region, cilantro made its way along the spice routes in Spain. From there, the Western expansion of the Spanish empire brought new cooking styles and ingredients across the ocean to the “New World.” It continues to be grown in Brazil, Cuba, the Dominican Republic, El Salvador, Costa Rica, Puerto Rico, Mexico, and the United States. Cilantro is harvested in fresh cut bunches, and has a distinct “fresh” flavor. Most salsas that you dip your chips into contain cilantro as it is a staple herb in Latin America. The seeds of the cilantro plant are dried and appear in

spice racks whole or ground with the name of coriander.

Oregano is a culinary herb with leaves that have an aromatic, warm, and slightly bitter taste. This popular herb is commonly used in Italian cooking, mostly in its dried state, as a “pizza sauce herb” but has its origins in Greece. The Romans also used oregano because they enjoyed the taste and found it easy to grow. Their love of the herb helped spread its use throughout Europe and Northern Africa. It is used in the Philippines, Argentina, and throughout Latin America. In Mexico, it can be used to season meats, stews, and soups and the aroma in the leaves is often used to flavor Mexican rice.

Basil has been cultivated for more than 4,000 years. There are more than 200 different varieties of basil. Basil is native to areas in Asia and Africa and grows wild as a perennial on some Pacific islands. Basil was brought from India to Europe through the Middle East in the sixteenth century, and subsequently to America in the seventeenth century. Basil is a popular culinary herb used in many cuisines including Italian and Thai. Italians use a mortar and pestle to grind basil with oil, garlic, cheese, and nuts to make pesto. Pesto is commonly used as a pasta sauce. In Thailand, basil is used to infuse flavor into foods, like the traditional Thai green curry. The herb is added at the end of the cooking process to retain its aroma and flavor.

Herbs have been used to improve the flavor of foods throughout history. It is no different today. Take a trip around the world without even leaving your kitchen—use herbs!

NAME: \_\_\_\_\_

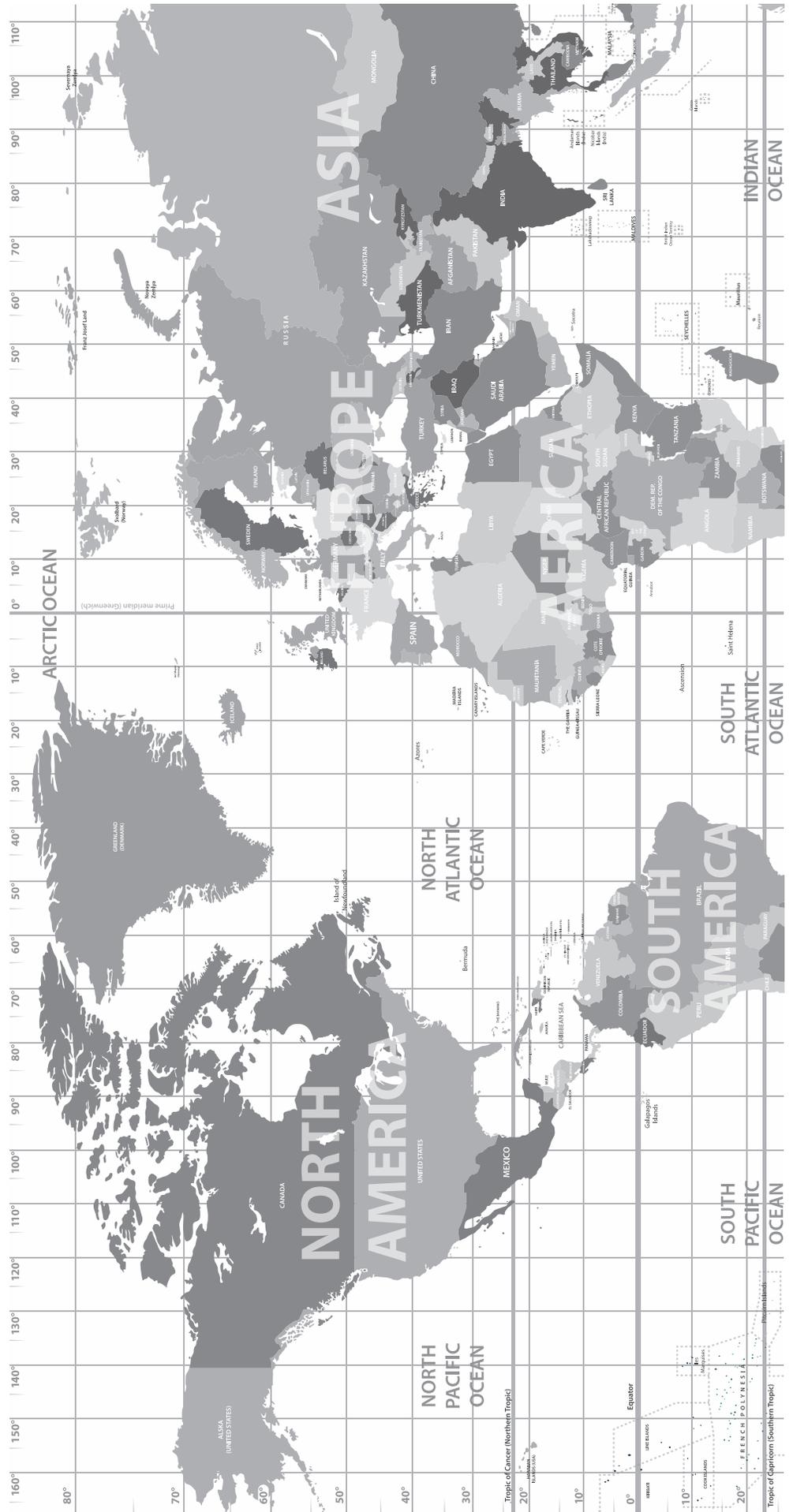
DATE: \_\_\_\_\_

CLASS: \_\_\_\_\_

*Fill in the blanks with names of different spices.*

USE THE LONGITUDE AND LATITUDE COORDINATES TO PLOT AND LABEL EACH LOCATION ON THE MAP.

1. \_\_\_\_\_, is an herb that is added to food eaten in this country's culture. (15°N, 101°E).
2. \_\_\_\_\_, used in pizza sauce, originally had its roots in this country. (39°N, 22°E).
3. Native to Arab countries near the \_\_\_\_\_ region, cilantro made its way along the spice routes to this country. (40°N, 4°W)
4. The aroma of oregano leaves is often used to flavor \_\_\_\_\_ in this country. (24°N, 103°W)
5. Known for its "fresh" flavor, \_\_\_\_\_ is presently grown in countries that border this body of water. (15°N, 75°W)



# Herb Observation Rubric

	BASIL		OREGANO		CILANTRO	
	FRESH	DRIED	FRESH	DRIED	FRESH	DRIED
<b>SKETCH</b> What does the sample look like?						
<b>COLOR</b> What is the specific color?						
<b>TEXTURE</b> What does it feel like?						
<b>TASTE</b> What adjective describes the taste?						
<b>FLAVOR</b> How strong is the flavor on a scale from 1-10? 1 is weak, 10 is strong						

## PEPPER PIZAZZ

# CALIFORNIA CROP TAKES YOU FROM SWEET TO HEAT

Depending on the variety, California-grown peppers bring sweet or heat to cuisine from around the world—and in your kitchen, favorite restaurant, or local deli.

“When we first started, there weren’t a lot of people outside of the West Coast and the Southwest that really knew about peppers, especially the hot peppers,” said Pete Aiello, who owns and operates one of the largest pepper farms in the country with his father, Joe.

The father-and-son team runs Uesugi Farms, a family operation based in Gilroy, where conditions are ideal for growing a variety of crops. As first- and second-generation farmers, Joe and Pete grow, pack, and ship an assortment of vegetables, but specialize in peppers—from sweet varieties like red bells to tongue-scorchers like the Bhut Jolokia.

Most plentiful during the summer months, the pepper is a warm-season crop that thrives at temperatures of 75 to 85 degrees. Joe and Pete grow thousands of acres of peppers—near their headquarters in Gilroy, as well as in Bakersfield, Holtville, the Coachella Valley, and Mexico—to meet year-round demand. Most of their pepper acreage consists of green, red, and yellow bell peppers. In times of high summer temperatures, bell pepper harvest starts in late afternoon and runs until midnight or beyond. “Picking peppers in cooler temperatures is not only more comfortable for employees, but also better for green bell peppers, which are sensitive to sustained periods of sunlight and extreme heat,” Pete said.

Once harvested, the Aiellos’ crop is graded, packed into boxes, and placed in a 45-degree cooler. The fresh bells are then shipped to grocery stores and fast-food chains throughout the United States; the spicier pepper varieties are processed and sold in the form of brand-name products that, in some cases, are also shipped to markets overseas.

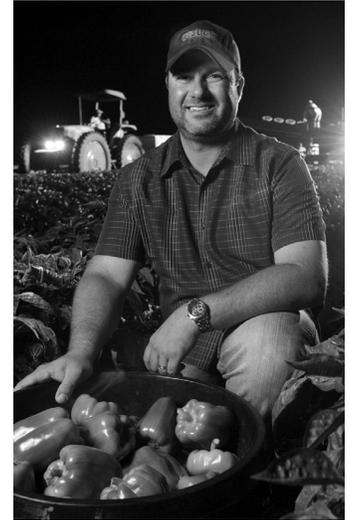
Peppers are the fruit of the *Capsicum* genus and are members of the nightshade family that includes potatoes, tomatoes, and eggplant. Their varying degrees of heat come from capsaicin, a chemical compound concentrated in the internal membrane of the plant where the seeds are attached.

From mild to what Pete describes as “gnarly” hot, Uesugi Farms grows peppers at all levels on the Scoville heat index (which indicates the amount of capsaicin present). All are full of vitamin C and a variety of antioxidants, including lycopene, that have been shown to have disease-fighting and health-promoting properties.

“People really like the versatility of a pepper. It is a great flavoring agent when you add it to your cooking,” Pete said. “You can choose all kinds of different varieties to get different combinations of flavor and heat.”

No matter how he picks them, growing peppers in California is exactly where Pete wants to be. “I take pride in being a California farmer,” he said. “And I’m extremely passionate about feeding people.”

This article was reprinted with permission from the August 2012 edition of California Bountiful Magazine, a publication of the California Farm Bureau Foundation. Story by Christine Souza and photos by Paolo Vescia. Read it online at [californiabountiful.com](http://californiabountiful.com).



## READING COMPREHENSION QUESTIONS

READ THE INFORMATIONAL TEXT, *PEPPER PIZAZZ*. ANSWER THE QUESTIONS BELOW USING COMPLETE SENTENCES.

1. Where do the Aiellos grow peppers? Why do they grow them in different locations?
2. Why are peppers picked at night?
3. Who is Joe Aiello, and why is he important to this text?
4. Identify at least two health benefits of eating bell peppers stated in the text.
5. The author uses the phrase “tongue-scorchers” to describe a variety of pepper. How does this word choice effect the reader?
6. What does versatility mean? Use the text to support your definition.
7. What is capsaicin and how does it affect a pepper’s flavor?
8. The text states, “California crop takes you from sweet to heat.” Give a specific example of a “sweet” pepper variety and a “heat” pepper variety.
9. Are you more likely to enjoy a hot pepper or a sweet pepper? Explain.
10. Draw a picture to illustrate the steps that occur after the peppers are harvested. *Use details from the text.*

# Pass the Peppers

**THE BIG QUESTION:** How can I use an active voice to make my writing more interesting?

**Background:** Using an active voice makes writing clearer and more concise. In active voice, the subject of the sentence performs the action. In passive voice, the subject receives the action.

*Example:* **Passive voice:** The peppers were picked by the harvester.  
**Active voice:** The harvester picked the peppers.

*In this activity, you will write each passive voice sentence with an active voice.*

1. Tomatoes and bell peppers are also included in the *Solanaceae* family. \_\_\_\_\_  
\_\_\_\_\_

2. The bell peppers were ruined by the freezing temperatures. \_\_\_\_\_  
\_\_\_\_\_

3. Red, yellow, and orange colors were shown as the peppers ripened. \_\_\_\_\_  
\_\_\_\_\_

4. The pepper seeds were sown by the farmer in April. \_\_\_\_\_  
\_\_\_\_\_

5. During harvest, peppers are shaken from the plant by a machine. \_\_\_\_\_  
\_\_\_\_\_

6. The peppers are transferred to produce bins by a conveyor belt. \_\_\_\_\_  
\_\_\_\_\_

7. Sheds located near the fields are where fresh market peppers are graded and packed. \_\_\_\_\_  
\_\_\_\_\_

8. Bell peppers were carried throughout the world by Spanish and Portuguese explorers. \_\_\_\_\_  
\_\_\_\_\_

9. Ripening peppers can be damaged by the sun. \_\_\_\_\_  
\_\_\_\_\_

10. The crop was threatened by inclement weather, pests, and weeds. \_\_\_\_\_  
\_\_\_\_\_

**TRY THIS: USE THE ARTICLE, *PEPPER PIZAZZ*, TO WRITE YOUR OWN PAIR OF ACTIVE AND PASSIVE VOICE SENTENCES.**

\_\_\_\_\_  
\_\_\_\_\_

# PERFECTLY PICKLED: PROBIOTICS PACK A PUNCH



Long before probiotics became a health and nutrition buzz word, cultures throughout history and across the globe were celebrating fermented, or pickled, foods. Historically, the process of pickling foods was intended as a preservation method. Today, nearly every global culture includes at least one fermented food in its culinary heritage.

Russian microbiologist Elie Metchnikoff (1845-1916) was the first to associate the consumption of fermented dairy products with the good health and longevity of Bulgarians back in 1907. He proposed that the acid-producing bacteria in fermented dairy products could prevent what he called “fouling” in the large intestine. He believed if eaten regularly, these foods could lead to a longer, healthier life.

It is increasingly understood that consuming certain types of microorganisms, also called bacteria, may have positive health outcomes. Our bodies are home to both good and bad bacteria. They are everywhere, including the stomach. Under normal condi-

tions, good bacteria in the stomach outnumber the bad bacteria. Probiotics found in pickled foods provide a boost in healthy bacteria and create a physical barrier against unfriendly bacteria.

Lactic acid fermentation, or lacto-fermentation, is among the most common methods and one of the easiest to experiment with at home. In this type of fermentation, the vegetable is soaked in a salt brine, allowing the growth of bacteria that eat the vegetable’s sugars and produce tart-tasting lactic acid. Salt plays a pivotal role

in traditional fermentation by creating favorable conditions for the good bacteria, preventing the growth of bad bacteria, and adding flavor.

According to the Harvard School of Medicine, the scientific community agrees that there are potential health benefits to eating foods with probiotics. However, more research is needed to solidify the claims. Medical researchers affirm, “the best we can

say right now is they won’t hurt and may help.”

## GLOBAL CULTURES HAVE CRAFTED UNIQUE FLAVORS AND TRADITIONS AROUND FERMENTATION.

**KIMCHI** - A spicy cabbage dish popular in Korean culture.

**KOMBUCHA** - A tangy tea flavored with herbs and fruit that originated in China.

**MISO** - A paste made from barley, rice, or soybeans with its roots in Japanese culture.

**CHUTNEY** - A spicy condiment made of fruits or vegetables originating in India.

**Sources:** Harvard Health Publishing. (2017, June 7). *The Benefits of Probiotics Bacteria*. Retrieved July 13, 2018, from <https://www.health.harvard.edu/staying-healthy/the-benefits-of-probiotics>

Academy of Nutrition and Dietetics. (2017, May 17). *The History and Health Benefits of Fermented Food*. Retrieved July 13, 2018, from <https://foodandnutrition.org/winter-2012/history-health-benefits-fermented-food/>

**TEXT ANALYSIS**

# PERFECTLY PICKLED: PROBIOTICS PACK A PUNCH

1. Give two examples of fermented foods and the cultures they originated in.

---

---

---

2. What did Russian microbiologist Elie Metchnikoff believe about fermented foods?

---

---

---

**PROBIOTICS MAY HELP:**

- Improve immune function
- Protect against hostile bacteria to prevent infection
- Improve digestion and absorption of food and nutrients.

3. What is one of the most common methods of fermentation?

---

---

---

4. In your own words, what are probiotics?

---

---

---

5. What does lactic acid bacteria do?

---

---

---

6. What role does salt play in the fermentation process?

---

---

---

7. Should people be encouraged to eat foods with probiotics? Why or why not?

---

---

---

# ADDITIONAL RESOURCES

## OTHER ACTIVITIES

1. Herbs are commonly used for cooking, but may be used in non-food items as well. Investigate the ingredients list on personal care products (such as shampoo or toothpaste) in your home to discover other uses for herbs.
2. Under good conditions, green bean seeds germinate in just eight to 10 days. Fill each compartment of an egg carton with soil. Place one seed in each compartment, just under the soil. Mist regularly with water and watch your beans grow. Once they develop into small seedlings, divide the compartments and plant in a container or garden bed.
3. Use online resources to research the health benefits of red, green, and yellow bell peppers. How do they compare nutritionally? Make a set of graphs to illustrate your findings.
4. Always have fresh herbs at your fingertips by preserving them in your freezer. Finely-chop herbs such as thyme, rosemary, sage, and oregano. Pack the chopped herbs into the wells of an ice cube tray. Pour olive oil in each well until the herbs are covered completely. Freeze the tray until hard. Remove cubes and store for future use in a labeled container in the freezer.

## RESOURCES

### Learn About Herbs

The Herb Society of America promotes herbs as valuable, useful, and essential parts of our lives. The Society values their aesthetic, fragrant, medicinal, and culinary properties. Print and digital resources provide windows into herbal history and lore, growing tips, and resources especially for kids.

The Herb Society of America  
9019 Kirtland Chardon Road  
Kirtland, OH 44094  
Phone: (440) 256-0514  
Website: [herbsociety.org](http://herbsociety.org)

### Harvest of the Month

Harvest of the Month features ready-to-use resources that can be used at school or in-home. Includes hands-on opportunities to explore, taste, and learn about the importance of eating fruits and vegetables and being active every day.

California Department of Public Health  
Nutrition Education and Obesity Prevention  
Phone: (916) 449-5371  
Website: [harvestofthemonth.cdph.ca.gov](http://harvestofthemonth.cdph.ca.gov)

### UC Master Food Preserver Program

The University of California Master Food Preserver Program extends UC research-based information about home food safety and preservation to the public. Preservation guides are available for a wide variety of California grown commodities.

UC Division of Agriculture & Natural Resources  
2801 Second Street  
Davis, CA 95618-7774  
Phone: (530) 750-1393  
Website: [mfp.ucanr.edu](http://mfp.ucanr.edu)

### Chile Pepper Institute

The Chile Pepper Institute is an international, non-profit organization devoted to education and research related to peppers. Their website features everything from interesting and useful facts about peppers to Chile pepper science for kids. The online shop offers Chile products and an extensive inventory of Chile pepper seeds. Chile enthusiasts can visit the visitor center and gift shop located on the New Mexico State University campus.

Chile Pepper Institute  
Gerald Thomas Hall, Room 265  
945 College Avenue  
Las Cruces, NM 88003  
Website: [cpi.nmsu.edu](http://cpi.nmsu.edu)

## LITERATURE ABOUT AGRICULTURE

Caduto, Michael J. and Joseph Bruchac. *Native American Gardening: Stories, Projects and Recipes for Families*. Fulcrum Publishing, 1996. Stories, projects, and recipes that relate to Native Americans from North America. Each story relates to one aspect of gardening, such as soil preparation or harvest. ISBN 978-1-55591-148-5

Fleischman, Paul. *Seedfolks*. HarperTrophy, 1999. One by one, a number of people of varying ages and backgrounds transform a trash-filled inner-city lot into a productive and beautiful garden. In doing so, the gardeners are themselves transformed. ISBN 978-0-06-447207-4

Hesse, Karen. *Out of the Dust*. Scholastic Press, 1999. In a series of poems, 5-year-old Billie Jo relates the hardships of living on her family's wheat farm in Oklahoma during the Dust Bowl years of the Depression. ISBN 978-0-590-36080-7

Jimenez, Francisco. *The Circuit*. University of New Mexico Press, 1997. This series of short stories about the life of a migrant child follows a family through their circuit of work over the years. ISBN 978-0-8263-1797-1



**Learn About Ag**  
California Foundation for  
Agriculture in the Classroom

[LearnAboutAg.org](http://LearnAboutAg.org)