



### History of a Strawberry

Scientists believe the first cultivated strawberry originated from *Fragaria x ananassa* as an accidental hybrid. This occurred between *F. chiloensis*, which grows along the western seaboard of North and South America, and *F. virginiana*, which is a woodland species found mostly in eastern North America. Indigenous people ate both. In the early 16th century, plants from both varieties were brought to Europe, where they were grown separately.

Click or scan below to learn more!

History of the Strawberry



Strawberry: A Brief History



### HYBRIDIZATION

The What, the How, & the Why?

#### What is hybridization?

Hybridization is the process of crossing two genetically different individuals to result in a third with a different, often preferred, set of traits.

#### How do scientists use hybridization?

In hybridization, the scientist takes pollen from the flower of one strawberry plant variety and transfers it into the flower of another variety of strawberry plant. In agriculture, it is used to create more sustainable crops, varieties that combine good features of the two parents, or new flavors.

#### Why do they do it?

With a growing population and a high demand for delicious and diverse foods, farmers have to maintain genetic diversity while still producing a healthy and sustainable crop. Hybridized crops have many benefits including insect and disease resistance.

### STRAWBERRY MATH

(Answers found on back page)



Americans eat on average 5 lbs. of strawberries each year.



16 strawberries = 1 lb

1. How many strawberries does the average American eat per year?
2. How many strawberries are in a quart?
3. How many strawberries are in a pint?
4. How many strawberries are in a gallon?
5. How many strawberries would you need to make 4 strawberry pies if it takes 2 quarts of strawberries to make one strawberry pie?

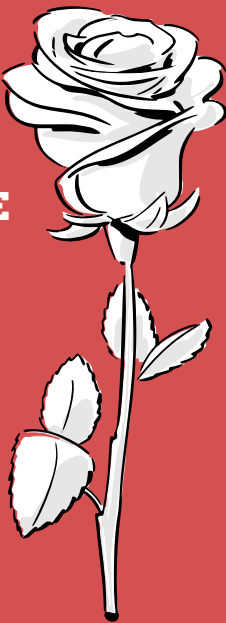
### JUST THE FACTS...

➤ Strawberries are eaten by 94 percent of Americans.

➤ Strawberries are a member of the **ROSE** family, which also includes raspberries, blackberries, cherries, apples and pears.

➤ In 2001, **strawberries** were named the **official state red berry**.

➤ **North Carolina** is one of the **TOP 5 largest producers** of strawberries in the United States.



Want to learn more? Scan or click here for the Sweet Sweet Strawberries video from America's Heartland



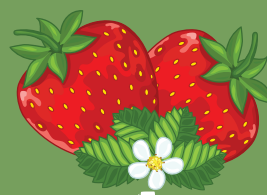
### Many Thanks!

A big thank you to Erica Edwards, Ed.D for her efforts in assembling the content and Heather Barnes, NCDA&CS Marketing Specialist, for her contributions necessary to produce this publication.

THANK YOU!

# From Field to Store

## The Life Cycle of a Strawberry Plant



Strawberries can be grown from a seed, but this is not generally the way farmers grow strawberries. Like most fruit crops, they are vegetatively propagated from a plant part and not a seed. Strawberries make this easier than some plants because they naturally **propagate** prolifically through their **runners** and **daughter plants**.



Strawberry nurseries specialize in growing **parent plants** to harvest their daughter plants, not the fruit. Before they grow roots, daughter plants may be sold to farmers or other nurseries. Farmers may put the daughter plants into trays and let them root, which is called a **plug**. Or, they may transplant the daughter plants to a field where they grow roots. These plants are dug in the fall, soil is removed from the roots and these “bare root plants” are sold to farmers and gardeners.



Every fall, strawberry farmers start with new plants. Plugs or bare root plants are transplanted into rows of soil covered with agricultural black plastic. Planting on black plastic helps with weed control and protects the fruit from touching the soil, keeping it clean. Black plastic warms the soil during the winter, so plants grow longer before going dormant.



Strawberries are the first fruit to ripen in the spring and can be harvested during the months of April, May, and June.



Strawberries should be picked every other day or about 3 times a week, with the best time to pick in the early morning hours.



Then off to the shelves for consumers to purchase at local farm stands, farmers markets and grocery stores.



## VOCABULARY

**Antioxidants** – substances that inhibit oxidation in living organisms and remove potentially damaging oxidizing agents.

**Daughter plants** – plants that naturally reproduced through the mother plant.

**Hybridization** – the process of plant breeding with an individual of another species or variety.

**Irrigation** – the supply of water to land or crops to help with growth.

**Parent plant (mother plant)** – an organism that has produced one or more organisms similar to itself.

**Plug** – small-sized seedling, often grown in trays to be transplanted into a larger area.

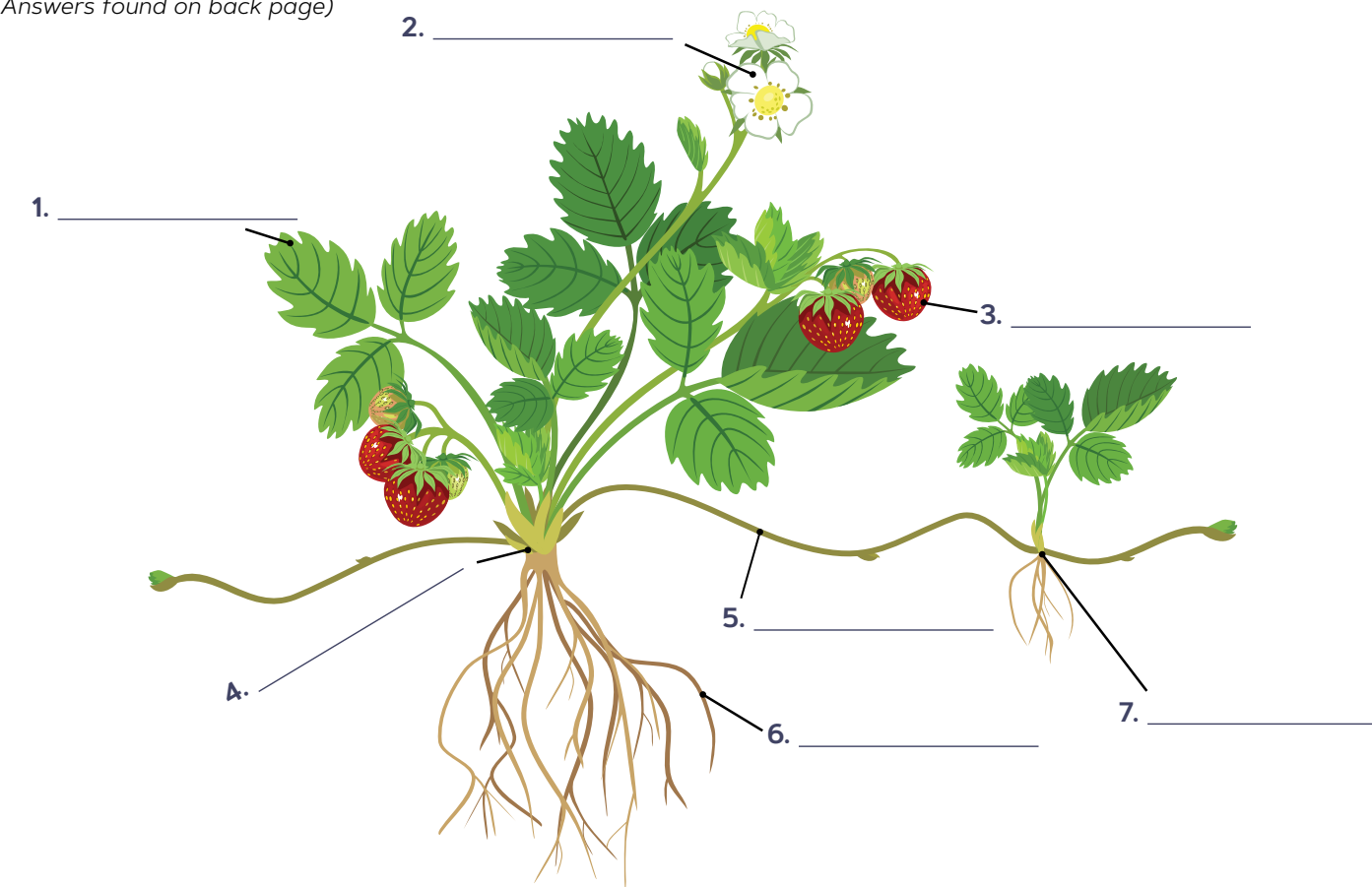
**Propagation** – the breeding of an organism (plant) by natural processes from the parent stock.

**Runners** – shoots or branches off of the strawberry plant often referred to as a “daughter plant.”

## Do you know the parts of a strawberry plant?

Label the parts of the plant below.

(Answers found on back page)



## STRAWBERRY SEASONS



### Strawberries in the Fall

Strawberry farmers transplant in the fall, from late September through early October.

### Strawberries in the Winter

Weather forecasts are important to farmers in the winter because of dry conditions, rain, and extreme temperatures that drop below freezing (32 degrees Fahrenheit or lower).

### Strawberries in the Spring

Strawberry harvest is started in mid-April and can continue through June.

### Strawberries in the Summer

After harvest, farmers clean up fields by removing the black plastic and drip tape. Next, they plow up the soil and plant a cover crop. Alternatively, some farmers may remove the strawberry plants, and plant a different crop, which is referred to as double cropping.

## STRAWBERRY TECHNOLOGY

### Drip Tape Irrigation & Plasticulture

**Irrigation** is the supply of water to land or crops to help with growth. There are many kinds of irrigation systems:

- o Central pivot irrigation & large moving boom systems
- o Solid set overhead irrigation
- o Drip or trickle irrigation
- o Furrow or flood irrigation

*What type of irrigation have you seen riding on your way to school or on your school campus?*

### Plasticulture

North Carolina farmers use a method to grow strawberries called plasticulture. This method uses an agricultural black plastic to cover the soil. Made for farming, this plastic is very thin yet strong and flexible. The flexibility of the plastic allows it to gently stretch over the soil without tearing. The black plastic warms the soil, acts as mulch to suppress weeds, and conserves water. It also limits diseases by keeping fruit from touching the soil. Agricultural black plastic is usually 5 feet wide and comes in large-sized rolls.



## STRAWBERRY NUTRITION FACTS

|                                                                                                                                                                                 |                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|
| 6–9 berries per serving                                                                                                                                                         |                      |
| <b>Serving Size</b>                                                                                                                                                             | <b>1 cup</b>         |
| <b>Amount per serving</b>                                                                                                                                                       | <b>50</b>            |
| <b>Calories</b>                                                                                                                                                                 |                      |
| % Daily Value and benefits                                                                                                                                                      |                      |
| <b>Potassium</b>                                                                                                                                                                | <b>18mg</b>          |
| <b>Fiber</b>                                                                                                                                                                    | a significant source |
| <b>Vitamin C</b>                                                                                                                                                                | excellent source     |
| help protect human eyes from free radicals in UV rays                                                                                                                           |                      |
| <b>Manganese</b>                                                                                                                                                                | good source          |
| <b>Antioxidant compounds</b>                                                                                                                                                    | rich source          |
| e.g. anthocyanin, quercetin, resveratrol, and ellagic acid; helps reduce risk of heart disease, cancer, and hypertension; improves immune systems and reduces cognitive decline |                      |
| <b>Polyphenol compounds</b>                                                                                                                                                     | good source          |
| linked to promoting proper brain functionality by protecting the central nervous system against neurodegenerative diseases, such as Alzheimer's, Parkinson's, and dementia      |                      |

## Strawberry Pizza



## INGREDIENTS

### Crust

3 cups flour  
1-1/3 cup shortening  
1 Tbsp sugar  
1 tsp salt  
1 egg  
1 Tbsp white vinegar  
6 Tbsp ice cold water

### Filling

2 packages (8 oz) cream cheese, softened  
1 cup sugar  
4 eggs  
2 Tbsp fresh lemon juice

### Topping

2 lbs. fresh strawberries  
14 oz. Marie's strawberry glaze  
Whipped cream

### Crust

Mix flour, shortening, sugar, and salt together, until like course cornmeal. Beat egg, add vinegar and water, pour into flour mixture. Mix until just blended. Chill in refrigerator 30 minutes. Then roll crust out on floured board to about 1/4" thick. Place on a medium-size pizza pan. Flute edges and prick with a fork. Bake at 375 degrees F. for 12–14 minutes. Let cool slightly.

### Filling

Cream together ingredients until smooth and creamy. Pour into the slightly cooled crust. Bake at 350 degrees until knife near the center comes out clean. Cool. Refrigerate overnight.

### Topping

Clean and slice strawberries. Fold in strawberry glaze and pour on top of the pizza. Keep refrigerated. Serving: Cut into pizza-style slices. Serve with a squirt (or dollop) of whipped cream on each slice.

**Note:** You may also assemble and serve the same day rather than refrigerate overnight and assemble on second day.

Scan or click here  
for more recipes



# Career Corner



## Buck Buchanan

*Lumpy's Ice Cream*

### Tell us about your background.

I trained as a chef, graduating from Newberry College in Boston. After graduation, I traveled the country, learning how to blend flavors. My interest in ice cream was peaked while living in Vermont. After moving to North Carolina with my wife and two children, I spent three years studying the science of dairy and ice cream. My goal was to make ice cream that was natural, wholesome and real for my children. The first flavor I made was vanilla and that was the start of Lumpy's Ice Cream.

### What are some things you do in your job?

I develop all the ice cream recipes. Research is the key. Not only do I need to identify the "real trends," I must also consider how the ingredients blend together, how they will freeze and if I can source ingredients locally. Developing a recipe can take 20 minutes or four years. Every ice cream I make is fresh and homemade. For example, I make marshmallows for Rocky Road ice cream. Most of the original 150 flavors (we now have more than 450) were named after personal friends.

### Why is it important to include local strawberries and other ingredients in your ice cream?

Community is a big part of the success of Lumpy's. If I can buy local I will, preferring to buy within 10 miles but going up to 100 miles away from our Wake Forest location. Local tastes better, plain and simple. The more we support local, the stronger our community is. The more we buy here the more farms can stay. It's important to keep our neighbors working. I connect with local farmers by visiting farmers markets or meeting them at events like the North Carolina State Fair.



## Christina Wrenn

*Strawberry Farmer*

### How did you get your start growing strawberries?

I was raised on a small beef cattle farm in western NC and participated in 4-H and FFA. It wasn't until college, when I took a horticulture class and interned at an NCDA & CS Research Station, that I realized my love for plants. My first encounter with strawberry farming was in 2013 when I met my husband, Austin. When I graduated, I followed him to help restart his family's small produce farm.

### What do you love most about your job?

I love interacting with customers and having people come to the farm. People are not always understanding of agricultural production and what it takes to grow a crop, and I love teaching people about what we do and why. It gives them knowledge and makes them feel empowered to know how their food is grown. The enjoyment families get from visiting our farm keeps me going.

### What would you tell someone who is interested in this as a career?

I would say they need a farmer as a mentor to help teach them what to do. There are so many things that you must learn by doing and cannot learn through YouTube or a textbook. Having a person to guide you will make a difference. A new farmer needs to be prepared to invest a large sum of money into the farm, with little guarantee they will get a return. Farming is a 24/7 job, so I only advise someone who truly loves it to become a farmer. Lastly, I would encourage someone to diversify their farming income. We grow cut flowers and rent some land to a row crop farmer, along with working off the farm. Most farming families in NC have one person working off the farm.



## Dr. Mark Hoffmann

*Extension Specialist & Assistant Professor, NC State University*

### Why did you specialize in small crops?

I did specialize in fruit production, because of the significant contribution to a healthy nutrition on the one hand, but cost-intensive production systems on the other hand. There is a lot of need to improve especially small fruit production systems to increase the access to nutrition.

### How important is the relationship between you and strawberry farmers?

Direct connections with farmers is probably the most valuable input I ever had in my life. It helps me to understand the problems and the challenges, it helps to create personal relationships, something I value a lot, and it is what drives our program! It also allows me to help solve the problems, which most often includes collaborative approaches.

### Tell us about the challenges and rewards you have had in your job?

Growing strawberries is not easy and there are many moving parts to the equation. The big challenges in strawberries are labor, weather and clean planting material. Larger research is only funded if it is collaborative and addresses one of those large challenges. So far, we have been successful in pulling together industry and academia in all the US, Canada and Europe to find funding to work on new tools for strawberry propagation, and we have a standing collaboration with UC Davis on developing soil disinfestation tools.

### What do you love most about your job?

The most rewarding thing to me is to see that we have a positive impact on someone else. I sincerely enjoy the work and mentorship with agents, our staff and with graduate students.

*This Ag Mag complements and connects to the following North Carolina Standard Course of Study:*

#### SCIENCE

3rd Grade 3.L.2, 3.L.2.1, 3.L.2.2, 3.L.3.3, 3.L.2.4 | 4th Grade 4.L.2, 4.L.2.1, 4.L.2.2 | 5th Grade 5.L.2, 5.L.2.1, 5.L.3, 5.L.3.1, 5.L.3.2 | 1.L.1.2, 2.L.2.1, 6.L.1.1, K.G.1.1

#### ENGLISH/LANGUAGE ARTS

3rd Grade RL.3.1, RL.3.7, RI.3.1, RI.3.4, RI.3.5, RI.3.7 | 4th Grade RI.4.1, W.4.1, W.4.6, W.4.7 | 5th Grade W.5.1, W.5.3, W.5.6 | 2nd Grade RI.2.5 | 1st Grade RI.1.7 | Kindergarten RF.K.1

**MATH** | 3rd Grade 3.MD.2 | 4th Grade 4.MD.1, 4.MD.2 | 5th Grade 5.MD.2

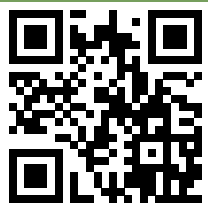
#### SOCIAL STUDIES

3rd Grade 3.E.1, 3.E.2, 3.C&G.2 | 4th Grade 4.H.2, 4.H.2.2, 4.G.1, 4.E.1 | 5th Grade 5.G.1, 5.E.1 | 6th Grade 6.H.1.1, 6.H.2.2, 6.H.2.3, 6.H.2.4, 6.G.1.4 | 7th Grade 7.H.1.1, 7.H.1.3, 7.G.1.1, 7.G.1.2, 7.G.2.2, 7.C.1.1 | 8th Grade 8.H.3.2, 8.H.3.3, 8.H.3.4, 8.G.1.1, 8.G.1.2, 8.C.1.2, 8.C.1.3

#### HEALTH

3rd Grade 3.NPA.1.2, 3.NPA.2.1 | 4th Grade 4.PCH.3, 4. NPA.1.1, 4.NPA.1.3 | 5th Grade 5.NPA.1.1

**Scan or click here for Strawberry Curriculum**



### Answer Key

#### Strawberry Math (p.1)

**1.** 80 strawberries **2.** 4 cups sliced strawberries or 1-1 ½ lbs **3.** 2 cups sliced strawberries or ¾ lbs. **4.** 16 cups **5.** 8 quarts

#### Parts of a Strawberry Plant (p.3)

**1.** Leaf **2.** Flower **3.** Fruit **4.** Crown (stem) **5.** Runner **6.** Roots **7.** Daughter plant

## Our mission statement:

**Ag in the Classroom (AITC)** is a unique educational program affiliated with **North Carolina Farm Bureau (NCFB)** with a mission to promote the importance of agriculture to all Pre-K through 12th grade public and private school teachers and students. Its inception occurred in 1985 by the approval of the NCFB Board of Directors. The educational program is dedicated to fostering an understanding of the importance of agriculture in North Carolina. Agriculture continues to be the number one industry in North Carolina. AITC enables teachers to meet the educational needs of their students through: North Carolina Standard Course of Study-based curricula, workshops for in-service and pre-service teachers, grants, ag literacy books, and county Farm Bureau support.

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