



## Agricultural Technology

Students learn how the Timucua and their ancestors utilized domesticated plants.



### STUDENT LEARNING GOAL:

Students will be able to identify how the Timucua and their ancestors utilized domesticated plants.

### SUNSHINE STATE STANDARDS ASSESSED:

#### Science

- SC.7.E.6.6 Identify the impact that humans have had on Earth, such as deforestation, urbanization, desertification, erosion, air and water quality, changing the flow of water.
- SC.7.L.16.4 Recognize and explore the impact of biotechnology (cloning, genetic engineering, artificial selection) on the individual, society and the environment.
- SC.7.L.17.2 Compare and contrast the relationships among organisms such as mutualism, predation, parasitism, competition, and commensalism.
- SC.7.L.17.3 Describe and investigate various limiting factors in the local ecosystem and their impact on native populations, including food, shelter, water, space, disease, parasitism, predation, and nesting sites.
- SC.8.N.1.6 Understand that scientific investigations involve the collection of relevant empirical evidence, the use of logical reasoning, and the application of imagination in devising hypotheses, predictions, explanations and models to make sense of the collected evidence.
- SC.8.P.9.2 Differentiate between physical changes and chemical changes.

#### Social Studies

- SS.7.G.2.3 Explain how major physical characteristics, natural resources, climate, and absolute and relative location have influenced settlement, economies, and inter-governmental relations in North America.
- SS.7.G.3.1 Use maps to describe the location, abundance, and variety of natural resources in North America.
- SS.8.A.2.7 Describe the contributions of key groups (Africans, Native Americans, women, and children) to the society and culture of colonial America.
- SS.8.G.5.1 Describe human dependence on the physical environment and natural resources to satisfy basic needs in local environments in the United States.

#### Language Arts

- LA.7.1.6.2 The student will listen to, read, and discuss familiar and conceptually challenging text.
- LA.7.4.2.2 The student will record information (e.g., observations, notes, lists, charts, legends) related to a topic, including visual aids to organize and record information, as appropriate, and attribute sources of information.
- LA.8.1.6.2 The student will listen to, read, and discuss familiar and conceptually challenging text.
- LA.8.4.2.2 The student will record information (e.g., observations, notes, lists, charts, legends) related to a topic, including visual aids to organize and record information, as appropriate, and attribute sources of information.
- LA.8.6.4.1 The student will use appropriate available technologies to enhance communication and achieve a purpose (e.g., video, digital technology).

#### Mathematics



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- MA.7.A.1.1 Distinguish between situations that are proportional or not proportional, and use proportions to solve problems.
- MA.8.A.6.1 Use exponents and scientific notation to write large and small numbers and vice versa and to solve problems.

### RESOURCES

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- “Prevention and Control of Glyphosate Resistant Pigweed in Soybean and Cotton.” 23 January 2012.  
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Beans [http://upload.wikimedia.org/wikipedia/commons/thumb/c/ca/Snijboon\\_peulen\\_Phaseolus\\_vulgaris.jpg/220px-Snijboon\\_peulen\\_Phaseolus\\_vulgaris.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/c/ca/Snijboon_peulen_Phaseolus_vulgaris.jpg/220px-Snijboon_peulen_Phaseolus_vulgaris.jpg)

Bottle

Gourd [http://upload.wikimedia.org/wikipedia/commons/thumb/a/a2/Courge\\_encore\\_verte.jpg/220px-Courge\\_encore\\_verte.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/a/a2/Courge_encore_verte.jpg/220px-Courge_encore_verte.jpg)

Chenopodium <http://upload.wikimedia.org/wikipedia/commons/thumb/1/11/Chenopodiumberlandieri.jpg/180px-Chenopodiumberlandieri.jpg>

De Bry Engraving of Timucua

Agriculture <http://fcit.usf.edu/florida/photos/native/lemoyne/lemoyne0/photos/lemoy020.jpg>

De Bry Engraving of Timucua Planting

Ritual <http://fcit.usf.edu/florida/photos/native/lemoyne/lemoyne0/photos/lemoy033.jpg>

De Bry Engraving of Timucua Taking Food to the

Storehouses <http://fcit.usf.edu/florida/photos/native/lemoyne/lemoyne0/photos/lemoy021.jpg>

Modern Martin House [http://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Progne\\_subis\\_-\\_Tulsa%2C\\_Oklahoma%2C\\_USA\\_-\\_nestboxes-8.ogv/mid-Progne\\_subis\\_-\\_Tulsa%2C\\_Oklahoma%2C\\_USA\\_-\\_nestboxes-8.ogv.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/c/c4/Progne_subis_-_Tulsa%2C_Oklahoma%2C_USA_-_nestboxes-8.ogv/mid-Progne_subis_-_Tulsa%2C_Oklahoma%2C_USA_-_nestboxes-8.ogv.jpg)

Palmer's

Amaranth [http://upload.wikimedia.org/wikipedia/commons/thumb/4/4d/Amaranthus\\_palmeri.jpg/220px-Amaranthus\\_palmeri.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/4/4d/Amaranthus_palmeri.jpg/220px-Amaranthus_palmeri.jpg)

Popcorn <http://upload.wikimedia.org/wikipedia/commons/thumb/0/0c/PopcornCobs2007.jpg/220px-PopcornCobs2007.jpg>

Pumpkin <http://upload.wikimedia.org/wikipedia/commons/thumb/9/99/Pumpkins.jpg/220px-Pumpkins.jpg>

Purple

Martin [http://upload.wikimedia.org/wikipedia/commons/thumb/b/b9/PurpleMartin\\_cajay.jpg/220px-PurpleMartin\\_cajay.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/b/b9/PurpleMartin_cajay.jpg/220px-PurpleMartin_cajay.jpg)



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Quinoa Grain Larger than

Life <http://upload.wikimedia.org/wikipedia/commons/thumb/f/f5/QuinoaGrains.jpg/120px-QuinoaGrains.jpg>

Sunflower [http://upload.wikimedia.org/wikipedia/commons/thumb/a/a9/A\\_sunflower.jpg/180px-A\\_sunflower.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/a/a9/A_sunflower.jpg/180px-A_sunflower.jpg)

Sunflower

Seed [http://upload.wikimedia.org/wikipedia/commons/thumb/2/29/Sunflower\\_seed\\_whole\\_and\\_kernel.jpg/220px-Sunflower\\_seed\\_whole\\_and\\_kernel.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/2/29/Sunflower_seed_whole_and_kernel.jpg/220px-Sunflower_seed_whole_and_kernel.jpg)

Teosinte and Corn <http://upload.wikimedia.org/wikipedia/commons/thumb/c/cb/Maize-teosinte.jpg/150px-Maize-teosinte.jpg>

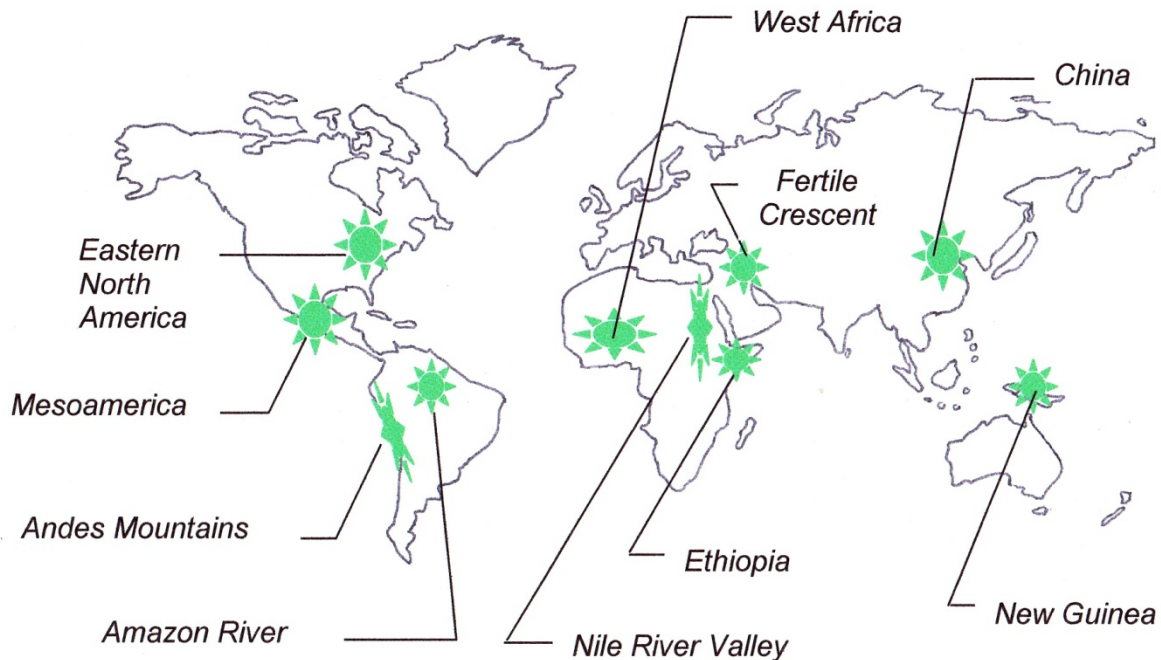
Tobacco [http://upload.wikimedia.org/wikipedia/commons/thumb/a/ae/Nicotiana\\_Tobacco\\_Plants\\_1909px.jpg/220px-Nicotiana\\_Tobacco\\_Plants\\_1909px.jpg](http://upload.wikimedia.org/wikipedia/commons/thumb/a/ae/Nicotiana_Tobacco_Plants_1909px.jpg/220px-Nicotiana_Tobacco_Plants_1909px.jpg)

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### **MATERIALS LIST FOR “Where Did Agriculture Begin?” ACTIVITY:**

For each student: Access to an atlas or geography book if needed.

### **ANSWER KEY FOR “Where Did Agriculture Begin?” ACTIVITY**



### **MATERIALS LIST FOR “Which Crop Would You Choose?” ACTIVITY:**

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For each student: Safety glasses. For each lab team of 4 students: 10-40 of each of the following: quinoa seeds, sunflower seeds, pumpkin seeds, kidney beans, corn kernel (all dried). For class: A scale capable of weighing in milligrams. Paper towels and a whisk broom for clean-up.

**Teacher Tips 1:** *Kidney beans are readily available with other dried beans in the grocery store.*

*Sunflower seeds and pumpkin seeds (without hulls) are usually available in the snack area. Dried corn is easy to find as an ornamental item in the fall. Other times of year, you can use deer corn from feed stores, squirrel corn from birding stores, or seed corn from garden stores. Because we can't get the same corn species the Timucua were using, just be sure that all of the students are using the same variety for their study. Quinoa (keen-wa) is becoming more easily available in regular grocery stores, often with the rice or in a health/alternative section. **Teacher Tips 2:** Quinoa seeds are very tiny, and they roll, so when they spill (and they will), the seeds will go everywhere. If possible, have students work over a tray with a raised edge to minimize the mess.*

**Teacher Tips 3:** *If your scale doesn't read down to milligrams, the students can still find seed weights by weighing many seeds together and dividing the weight by the number of seeds weighed. **Teacher Tips 4:** You'll notice that research for the activity titled "Why did the Old Crops Fall Out of Favor?" indicates that quinoa produces 0.1 pound per plant, while the weight test in this activity suggested 0.25 pounds per plant. Discuss with students possible reasons for this discrepancy:*

- *Different types of quinoa may produce varying seed weights and numbers.*
- *Measuring apparatus may not be appropriate for the job (i.e. having to weigh several grains and divide, rather than having a scale sensitive enough to weigh individual seeds).*
- *Don't forget user error. (This can be overcome by replicating the measurement – each lab group completes their own measurement using the same quinoa and the same process.)*

### ANSWER KEY FOR “Which Crop Would You Choose?” ACTIVITY:

**Answer:** Answers will be dependent on the weight data that students collect. The table below reflects the weights gathered by the author.

### Yield for Modern Versions of Plants Available to the Timucua People

Name of Seed	Average Seed Weight in Milligrams	Number of Seeds per Plant	Yield per Plant in Milligrams	Yield per Plant in Pounds
Quinoa Grain ( <i>Chenopodium quinoa</i> )	4 mg	28,000 - 56,000	112,000 – 224,000 mg	0.25 – 0.5 pounds
Kidney Bean (50 pods per plant)	600 mg	100 - 200	60,000 – 120,000 mg	0.13 - 0.26 pounds
Corn Kernel (2 ears per plant)	300 mg	1000 - 2400	300,000 – 600,000 mg	0.66 – 1.3 pounds
Sunflower Seed (1 flower per plant)	75 mg	800 - 2000	60,000 – 150,000 mg	0.13 – 0.33 pounds
Pumpkin Seed (2 pumpkins per vine)	150 mg	200 - 1400	30,000 – 210,000 mg	0.07 – 0.46 pounds

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Corn produced the most per plant. I thought it might be pumpkins, but they were actually the lowest seed producers. Maybe that's because they spend so much energy making the orange fleshy part of the fruit.

### **MATERIALS LIST FOR “Why Did the Old Grains Fall out of Favor?”ACTIVITY:**

For each student: a calculator.

### **ANSWER KEY FOR “Why Did the Old Grains Fall out of Favor?” ACTIVITY:**

- 1) 2 ears of corn x 500 kernels/ear x .043 ounces/kernel = 43 ounces
- 2) Answer: 2.7 pounds. Method: 43 ounces / 16 ounces per pound = 2.7 pounds.
- 3) Answer: 26.8 or 27. Methods: 10 plants/16 ounces = 1.6 ounces/plant. 43 oz / 1.6 oz = 26.8 chenopodium plants to produce as much as 1 corn plant.  
OR 2.7 pounds of corn/plant divided by .1 pounds of chenopodium/plant = 27 chenopodium plants to produce as much as 1 corn plant.
- 4) I guess I'd have switched to corn. It depends on whether or not there were lots of other leafy greens to be gathered wild. I don't think you can preserve the greens like you can dry corn, though. Maybe they needed to focus on preserving food for winter. That's why I would have chosen corn.

### **MATERIALS LIST for “Growing Your Own Crops” ACTIVITY:**

Teacher Tips: *This activity is a 4-month project; however, you can just run the beginning part, in which seeds are germinated. That part only takes about 2 weeks.* For each student: five cleaned yogurt cups, potting soil, 2 corn kernels, 2 beans, 2 pumpkin seeds, 2 sunflower seeds, a sprinkling of quinoa seeds. Access to water. Sunny area (for LOTS of pots) or growth lamps. Recording notebook. For class: Digital camera. If doing outdoor planting, you'll need space to garden, hoes and work gloves, hoses for irrigation, compost and fertilizer, garden shears, bags, bowls, or baskets for harvesting the crop. A groundskeeper willing to shred the garden contents after the project. An area to build a compost pile (visit <http://www.gardeninginfozone.com/how-to-make-a-compost-bin> for composting info). Bowls and pots to soak, rinse, and cook seeds and pumpkin flesh. Access to Power Point. An audience students can teach with their PowerPoint presentations.

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### **STUDENT ARTICLES, EXPERIMENTS, & ACTIVITIES:**

- 1) What is Agricultural Technology?
- 2) The Dawn of Agriculture
- 3) ACTIVITY: Where Did Agriculture Begin?
- 4) How It Actually Began
- 5) What Crops Did They Plant?
- 6) ACTIVITY: Which Crop Would You Choose?
- 7) Florida's Agricultural Latecomers
- 8) ACTIVITY: Why Did the Old Grains Fall out of Favor?
- 9) What Technologies Did the Timucua Use to Cultivate their Fields?

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- 10) Were the Timucua Practicing Modern Science?
- 11) Agricultural Science in Modern Florida
- 12) ACTIVITY: Growing Your Own Crops

### NEW TERMINOLOGY:

agriculture, amaranth, archaeologist, artificial selection, biological pest management, chenopodium, crop yield, cultivation, division of labor, domestication, engraving, germinate, GMO (genetically modified organism), gourd, herbicide resistance, insectivore, monocropping, mortar and pestle, nitrogen fixation, nutrient, reproductive rate, rind, silt, symbiotic relationship, teosinte

### ASSESSMENT OPTIONS:

**Writing Prompt #1:** Your school just received a grant to fund an organic agricultural project. The principal has proposed that every student volunteer ten hours to each phase of the project: planting, maintenance, and harvest. Think about whether you consider this a good school policy or a bad one, and why. Now write to persuade your school board that they should accept your view on this subject.

**Writing Prompt #2:** The Timucua grew a variety of food plants. Think about your favorite plant foods and consider which ones you might like to grow in a garden. Write to explain at least three plants you would like to grow and why.

**Assessment #1:** Based on your reading of the article titled, “Were the Timucua Practicing Modern Science?” discuss three ways in which the Timucua were OR were not using the scientific method.

**Assessment #2:** Based on the article titled, “What Technologies Did the Timucua Use to Cultivate their Fields?” explain how four different kinds of technology were utilized during a planting season.

**Assessment #3:** Based on your reading of the entire Agriculture unit, explain why you think the author included a section on genetically engineered crops.

### Classroom Technology Strategies

Using an online Flash Card maker, students will summarize **New Terminology** definitions. They should utilize one or more of these words in proper context when responding to the assessment questions. **On-line flash card creator:** <http://www.scholastic.com/kids/homework/flashcards.htm>