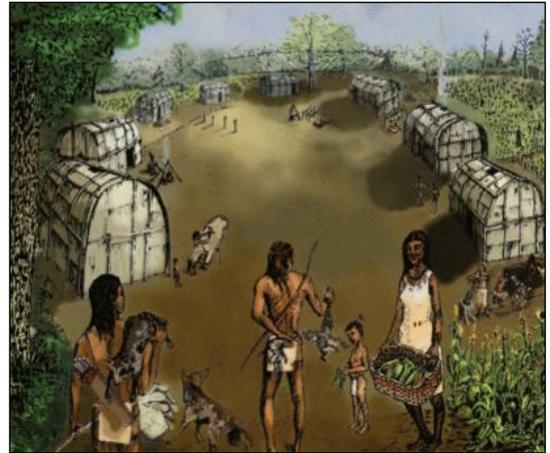


## Ancient Sustainable Farming in the Red River Gorge: The Three Sisters

A thousand years ago, Native peoples living in eastern Kentucky left their ancestors' hunter-gatherer-gardening way of life behind and embraced farming with a passion. By 750-800 years ago, farming villages, some with houses arranged around a central open plaza, were scattered across the region's narrow river and stream valleys. Fields of corn, beans, and squash extended for miles along the floodplains lining those waterways.



Artist reconstruction of a Fort Ancient village and crops ([bcplfusion.bcpl.org/Repository/FA.jpg](http://bcplfusion.bcpl.org/Repository/FA.jpg)).

In almost every agricultural community worldwide and throughout time, successful farmers grew a cereal grain with a legume. For the Fort Ancient farmers in eastern Kentucky, the cereal grain was corn and the legume was beans. Include squash, the ancient and familiar standby, and you have what many Native peoples still call the “Three Sisters.”

### Who Are the Sisters?

**pepo squash** The oldest sister, pepo squash (*Cucurbita pepo*), was a Kentucky native. Pepo squashes were first domesticated in Mexico around 10,000 years ago. In eastern North America, people independently domesticated their native pepo squashes by around 5,000 years ago. By about 1,400 years ago, their efforts to breed edible, meaty squash had produced thick-fleshed fruit with thin rinds. Pepo squashes include orange jack-o'-lantern pumpkins; acorn, zucchini, and pattypan squashes; and numerous types of ornamental gourds.

**corn** The tallest sister, corn (*Zea mays*), was originally domesticated in Mexico and South America about 8,700 and 9,600 years ago, respectively. Through *diffusion* (the process by which plants domesticated in one place spread into new areas), corn appeared in Kentucky 1,400 years ago via the American Southwest. Kentucky's Native farmers likely grew three different corn varieties: popcorn, flour or soft corn, and Eastern 8-Row corn, which has large, crescent-shaped kernels arranged in eight rows around the cob.

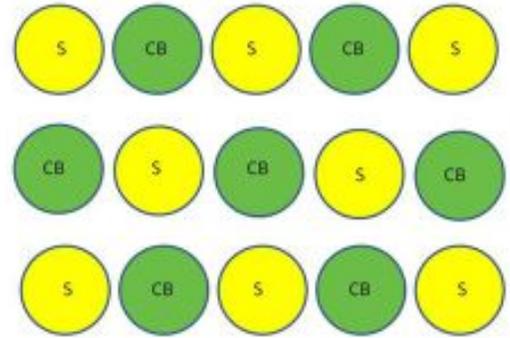
**common bean** The youngest sister, the common bean (*Phaseolus vulgaris*), was domesticated first in the Peruvian Andes 4,400 years ago and then later, independently, in Mexico about 2,400 years ago. Archaeologists are not exactly sure what route beans took to get to Kentucky. Nevertheless, it is quite clear that beans appeared in Kentucky's Native plant food inventory only 750-800 (though perhaps as early as 1,000) years ago. Like the other sisters, Native farmers grew many different varieties of beans.

Thus, despite each plant having such deep, ancient roots, Native farmers in eastern Kentucky began to grow this vegetable triad relatively recently.



## The Three Sisters System

Centuries before Europeans arrived with their farming system, Native peoples in eastern North America were successful farmers without plowing, irrigation, or the application of chemical pesticides or herbicides. In the Three Sisters system, farmers planted corn, beans, and squash together in hills spaced in a regular pattern in fields. Managing this sophisticated, sustainable and productive farming system required that Native farmers command the same kind of detailed knowledge – of crops, soil management, and their interaction – as farmers do today. And there were other factors to consider, too, like precipitation and temperature and how to manage the impacts of their seasonal fluctuations.



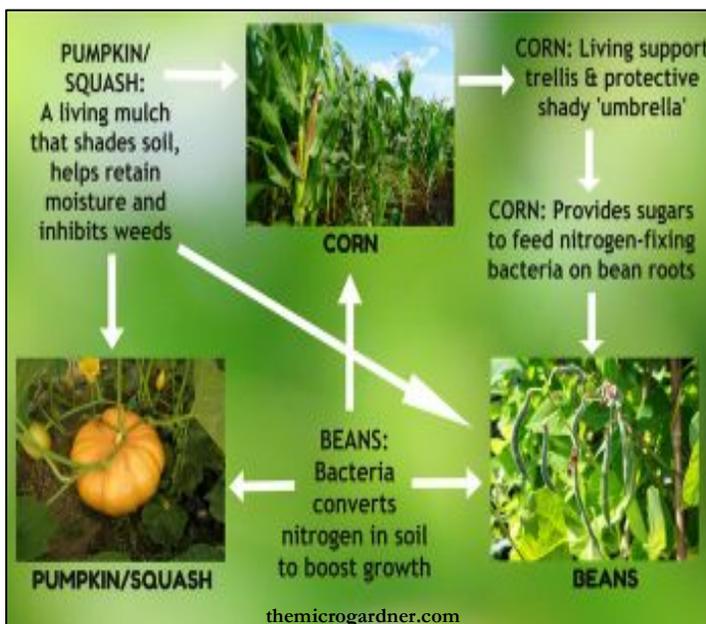
*One pattern of soil hills for planting squash, corn, and beans ([www.reneesgarden.com/articles/3sisters.html](http://www.reneesgarden.com/articles/3sisters.html)).*

The Three Sisters system depended for its success on soil mounds and intercropping. *Soil mounds* increased soil temperature and their height permitted better soil drainage. They helped maximize crop production by appropriately spacing plants throughout the field. Mounds minimized erosion and guarded against soil compaction. Mounds also maintained the soil's organic matter. After each harvest, Native farmers incorporated crop and weed residues back into the mounds. Their decomposition promoted good crop growth by increasing the soil's organic matter and releasing essential nutrients. Because of the limited soil disturbance, using mounds also prevented spring flushes of weed seedlings.

*Intercropping* involves planting complementary crops together. They thrive because they use nutrients, water, and light differently and therefore more efficiently. One crop modifies the environment to the benefit and the growth of another. Because intercropping mimics plant associations found in nature, all of the plants are more resistant to drought, flooding, blights (plant diseases), and insects.

### Each Sister Plays Her Role

Given corn's abundance, it was the main crop. Native farmers wanted to keep corn yields high, but still harvest extra protein, carbohydrates, and vitamins and minerals from the beans and squash.



This integrated system was greater than the sum of its parts, however. Corn requires a fairly high amount of nitrogen. Beans, as legumes, take nitrogen from the air and soil and convert it into a form that other plants can use. So beans functioned as a natural fertilizer, greatly increasing the yield potential of corn and squash. Squash, with its shallow roots and aggressive growth of broad leaves, served as a living mulch. It reduced weeds and, by shading the ground, held in soil moisture and decreased soil erosion.

It wasn't all chemical. Corn stalks served as natural poles, providing physical support for the climbing bean vines. The bean vines helped stabilize the corn plants in wind. The spiny squash plants helped attract beneficial insects that preyed on those that were destructive.

## Planting and Harvesting

In the spring, Native men prepared established fields by burning off the remains of the previous year's harvest. The women inspected the mounds – low hills about four inches tall spaced three-four feet apart within and between rows – and made them ready for planting.

Using dibble or planting sticks, women poked shallow holes in the hills, planting corn seeds saved from the previous year. As the corn plants emerged, the soil was gently mounded, or hilled, around them. In eastern Kentucky, the women used hoes made out of thick freshwater mussel shells or elk or deer shoulder blades lashed to wooden handles.

When the corn plants were four to six inches high, the women planted pole bean seeds around the young plants. They planted the corn and beans together. Squash they planted alone, or with the corn and beans in a seventh hill. If they had planted squash in every hill, its viney growth would have quickly overgrown the hills.

Native farmers planted extra corn to feed insects and animals, and to plant as seeds in the following spring. Even so, given corn's attractiveness to animals, they had to be alert as harvest time drew near. Temporary shelters near the fields or raised platforms in the fields provided places where women and children could sit and sing or make noise to drive the animals away.



*Diorama of the Three Sisters harvest ([www.angelfire.com/nj4/sera5/three\\_sisters.html](http://www.angelfire.com/nj4/sera5/three_sisters.html)).*

Green corn – “sweet” corn in its juicy and sweet stage – was the first to be picked. The women plucked or cut the ripe ears of corn off the stalks, but left the stalks standing for the beans. They also harvested corn once the ears had matured and the corn husks were dry. They harvested beans when the pods were green, or they waited until the beans were mature, after the pods had turned brown and shriveled. They picked the pods from the vines, threshing them in the fields to separate the beans from the pods and collecting the bean seeds. They harvested ripe squash fruits when their color changed. They removed the seeds from the fruits and spread them out to dry.

Native farmers stored their bounty for eating and saved a portion for springtime planting. The storage methods they used included aboveground cribs and below-ground silos. They hung corn cobs inside their homes, the husks braided together. They kept shelled corn, beans, and squash seeds in a cool dry place protected from rodents and moisture in covered containers. They stored thick skinned squashes whole.

The final task before the fields rested over the winter was to carefully return the crop and weed residues, especially the bean pods, back into the mounds for nutrient cycling. They worked the materials into the soil using hand tools made of wood, stone, and animal bone.

## YUM!

Eastern Kentucky's Native peoples lacked large domesticated animals as a source of protein. To meet their nutritional needs, they depended on wild animals, such as deer, bear, elk, and turkey. They also depended on the vegetable protein supplied by the Three Sisters.

Dishes that combine corn and beans are a good source of complete, high-quality vegetable protein. With the highest protein content among the vegetables, beans also are a great source of fiber, are rich in iron, and contain lysine, a vital amino acid. Corn is relatively low in protein, and it lacks important amino acids. But corn is high in calories and carbohydrates. Squash is a good source of calories, fiber, dietary fat, folic acid, vitamins, and minerals not found in corn or beans, and its seeds are good sources of protein and oil.



*Three Sisters bounty ([farmtoforkqueph.wordpress.com](http://farmtoforkqueph.wordpress.com)).*

Native peoples prepared corn in many different ways. Picked green, they roasted the ears in coals. Corn scraped off the cob was used in soups or gruels cooked in large jars and served in bowls, and it was added to fried, baked, or boiled breads. They parched corn by cooking it in dry heat then pounding it into a meal. Soaking dried flint corn kernels for several days in water mixed with wood ash removed the hull and produced soft and tender hominy. Flour or soft corn made excellent flour, and popcorn was a tasty treat.

Either in the pod or shelled, beans were cooked in soups and stews. Besides the flowers, Native peoples also ate squash in soups and stews. They could have roasted or baked the fleshy squash fruits whole in hot coals or sliced them into strips to dry for later use. Seeds were eaten whole or ground up and added to stews.

## A Native Gift

The ancient Native farmers of eastern Kentucky were the original organic farmers, knowledgeable and skilled. Far from being primitive or backward, their farming system was sophisticated and sustainable.

Planting corn, beans, and squash using the Three Sisters system was and is more than just a way Native peoples feed themselves. Customs, stories, myths, and legends surround the Three Sisters system and are part of continuing Native cultural traditions that respect and honor the plants. The Three Sisters system has helped support farming peoples who have used the land without destroying it.

For more information and activities for your classroom, we suggest you consult these three sources:

- **Native American Gardening: Stories, Projects, and Recipes for Families**, by Michael J. Caduto and Joseph Bruchac. Fulcrum Publishing, Golden, CO (1996).
- **Renee's Garden: Celebrate the Three Sisters: Corn, Beans, and Squash** by Alice Formiga [www.reneesgarden.com/articles/3sisters.html](http://www.reneesgarden.com/articles/3sisters.html)
- **The Three Sisters: Exploring an Iroquois Garden**, by Marcia Eames-Sheavly. Cornell Cooperative Extension Publication, Cornell University, Ithaca, NY (1993). [gardening.cals.cornell.edu/files/2016/07/newlogoThree-Sisters-Exploring-an-Iroquois-Garden1-199h8hj-xupent.pdf](http://gardening.cals.cornell.edu/files/2016/07/newlogoThree-Sisters-Exploring-an-Iroquois-Garden1-199h8hj-xupent.pdf)

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