

# Lesson Plan

**Description**  
 Indigenous peoples consider the growth, reproduction, and regeneration of all living things to be sacred. Lots of thought and knowledge goes into ensuring a healthy harvest that will endure to the seventh generation. This lesson explores the planting of the three sisters, corn, beans, and squash, and how they work together to grow.

- Learning Outcomes**
- Students will learn the advantages and disadvantages of both monocultural and polyculture farming
  - Students will learn about the importance of polyculture of the Three Sisters

**Specific Expectations**

**A3.2** investigate how science and technology can be used with other subject areas to address real-world problems

**B2.8** describe how different approaches to agriculture and to harvesting food from the natural environment can impact an ecosystem, and identify strategies that can be used to maintain and/or restore balance to ecosystems

**Introduction**

Aanii>Hello, my name is Shaylene Restoule. I am one of the Indigenous Program Interns at Science North, and I am also completing my Indigenous Studies degree at Laurentian University. I am an Anishinaabe kwe with relation to Dokis First Nation and Wikwemikong Unceded Reserve. I have gained a lot of knowledge throughout my years growing up of our Indigenous worldviews and how we can live in balance and harmony with the land and people around us.

This lesson introduces students to The Three Sisters, the three main agricultural crops of various indigenous communities: squash, maize (corn) and climbing beans. It’s a technique known as companion planting, with the cornstalks serving as a trellis for the climbing beans, the beans fixing nitrogen to their roots and stabilizing the corn and the wide leaves of the squash providing shade, keeping soil moist and preventing weeds.

The Three Sisters method is adapted to local environments and have widespread use. For example, The Three Sisters appear prominently in Haudenosaunee oral traditions and ceremonies and include dozens of varieties of beans and maize, as well as a few different types of winter squash that are used. It’s a healthy and prosperous way to grow crops, but as

food needs change, it's becoming more common to see agriculture move away from companion planting.

Monoculture farming is a type of agriculture that consists of growing only one type of crop at a time in a specific field. While it is the simplest solution for the growing demand for food as the world's population continues to rise, it has proven to come at a cost. In comparison, a polyculture type of agriculture is the intentional planting of two or more species at a time in a specific field.

#### Advantages of Monoculture Farming

- *Specialized Production* – Monoculture farming allows for farmers to specialize in a specific crop such as corn or wheat..
- *Maximum Yields* – Crops such as cereals have better yields if they are sown and grown as monocultures.
- *Easier to Manage and Maintain* – When it comes to harvesting, monoculture crops are easier to cultivate than polyculture crops.
- *Higher Revenues* – Due to the higher yields of their monoculture plants, farmers will most likely benefit from higher profits.

#### Disadvantages of Monoculture Farming

- *Pest Management* –Pests are known to be abundant in fields that continuously grow the same crop year after year since they can steadily consume their favourite food as well as easily reproduce.
- *Large Amount of Pesticide Use* –In order to avoid the destruction of their crop, farmers will apply a large amount of pesticides and herbicides to protect their crop.
- *Soil Degradation and Fertility Loss* – Monoculture farming disturbs the natural balance of soils since so many of the same plant species in one area drain the soil of its crucial nutrients.
- *Increased Water Usage* – Since monoculture fields only have one type of root present, the root system is incapable of maintaining the soil's structure which can cause erosion and loss of water uptake.
- *Impact on Pollinators* – Monoculture farming has a harmful impact on bees and other pollinators. By using high amounts of pesticides and herbicides, a pollinator's health is damaged, and they are often killed.

#### Advantages of Polyculture Farming

- *Natural Pest Resistance* – Since polyculture farming means a higher genetic diversity of plants, certain species can serve as a natural barrier toward pest infestations

- *Decreased Economic Risk* – The diversity of plants creates a habitat for many insects including crop-eating-eaters, who keep the crop eaters under control. More than people are fed by this garden, but there is plenty to be shared.
- *Enhanced food security* - By increasing the biodiversity through polyculture farming it is more likely that there will be a lesser need for specific nutrients and chemical fertilizers

#### Disadvantages of Polyculture Farming

- *Advanced Knowledge Required* – Polyculture farming can be a disadvantage to some as it requires more knowledge and understanding of the dynamic interactions between the crops.
- *Complicated Harvest* – It can be more complicated to harvest a polyculture crop as the multiple species of plants may require different equipment, have different growth rates as well as reach maturity at various times.

#### Three Sisters Planting

The three sisters are planted in May when the earth is most moist, this allows the corn seed to take water quickly, making it the first to emerge from the soil. Meanwhile the bean seed bursts and sends a rootling down to secure the emerging plant, joining the corn which has already grown to be six inches. The last sister to emerge is the squash, this birth order is essential to the success of the crop.

Having the three sisters grow in a three-dimensional sprawl rather than straight rows is effective for the vertical support of the sisters. The bean vine starts to grow and goes through the circumnutating process to find the corn to carry it. When the squash starts to grow it extends itself over the ground, sheltering the soil at the base of the corn and beans, keeping moisture in and other plants out. A three sisters garden yields more food than if you grew each of the sisters alone.

Polyculture fields are less susceptible to pest outbreaks than monocultures. The plant diversity provides habitats for a wide array of insects, including insects who eat the crop eaters.

### Material

- Large pot or container (at least 24 inches in diameter and 12 inches deep) with holes in the bottom – 4 containers total
- Small shovel and/or garden trowel
- Corn seeds
- Pole Bean seeds
- Squash or pumpkin seeds
- Watering can or water hose
- Potting soil – \*This type of soil is the ideal choice for growing plants in containers because it provides better drainage and is lightweight compared to regular gardening soil. This will provide enough air throughout the container to help prevent root rot and keep plants happy

### Action

The following activity has been designed as a container garden to control for potential competition from other plants that may be found in a school or communal garden. Students may not be able to observe the crops grow to their full maturity, but they should be able to witness the beans climb around the corn as well as the leaves from the squash create ground covering. It is recommended that this activity begins eight weeks prior to the end of the school year so that students can make proper observations.

#### Step 1 – Planting the Three Sisters Seeds

- Using one of the large containers (at least 24 inches in diameter and 12 inches deep), create at least 6 holes at the bottom of each container to ensure proper drainage. Without proper drainage, water will pool at the bottom which can be another cause of root rot.
- Add *potting soil* to each container until it is almost completely full, with approximately 3-4 inches of space from the lip of the container – This will ensure that water and soil does not overflow over the sides when you water the plants.
- Label the container as “Three Sisters”.
- Before sowing the seeds, you will want to soak six corn and six pole bean seeds overnight. As mentioned above, it is best to plant the three sisters in the ground during the month of May since it is the moistest. By soaking the corn and bean seeds, this will imitate planting the seeds in May and help kickstart the growth process. Once the corn and bean plants have begun to grow, you will eventually thin them to three or four seedlings.
- After soaking the seeds, you are ready to plant! Plant the six soaked corn seeds in a small circle, at least three inches apart. Next, plant your six pole bean seeds in a bigger circle (at least three inches away from the corn seeds) followed by six squash

seeds that will be placed in an even bigger circle (at least three inches away from the pole bean seeds). Follow the packaging instructions for the depth of planting required for each seed.

- Generously water your seeds and place by a bright window where it receives 6-8 hours of sunlight a day.

### Step 2 – Planting the “Monoculture” Seeds

- These containers are used to demonstrate that each sister does not thrive as well on its own than if it were to be with the other two sisters. It also demonstrates to students that planting in a monoculture fashion may not be as beneficial as planting in a polyculture way.
- Using the remaining three large containers (at least 24 inches in diameter and 12 inches deep), create at least 6 holes at the bottom of each container to ensure proper drainage. Without proper drainage, water will pool at the bottom which can be another cause of root rot.
- Add *potting soil* to each container until it is almost completely full, with approximately 3-4 inches of space from the lip of the container – This will ensure that water and soil does not overflow over the sides when you water the plants.
- As mentioned above, you will want to soak six corn seeds and six pole bean seeds overnight to help kickstart the growing process.
- Label the three containers as “Corn”, “Pole Beans”, and “Squash” so as not to mix them up and facilitate observations.
- Follow the instructions on each seeds package for planting. Plant six seeds of each plant in their designated containers.
- Generously water your seeds in each container and place the containers by a bright window where it receives 6-8 hours of sunlight a day.

### Step 3 – Maintaining Your Garden

- To know when the plants must be watered, insert your finger up to your first knuckle in the soil to see if it is dry. If it is moist and soil clings to your finger, you do not need to water. If the soil is dry, add enough water until it leaks out of the holes you have created at the bottom of the container.
- As the plants grow, you will need to weed out the weaker seedlings in each container.
- If the pole beans in the “Three Sisters” container are not making their way around the corn, gently move the tendrils towards/around the corn stalk.
- Once a week has passed after planting, students are to start their observations using their handout sheets. Using a ruler, they can measure the height of the seedlings throughout the eight-week period of growth. They can also make observations regarding colour, rate of growth as well as the general health of each crop.

**Consolidation/Extension**

It is possible to reduce the negative effects of monoculture farming by implementing crop rotation, only using fertilizer where it is crucial, decreasing herbicide and pesticide use, and using water in a more efficient manner. While these efforts may prove to be temporarily successful for farmers, they are unsustainable long term.

**Note:** Students can germinate their seeds in class and bring them home if they wish to plant their seeds in a home garden and follow the growing process all the way to harvest.

**Accommodations/Modifications**

- It is encouraged to complete this activity outdoors if possible.
- Students may work in pairs or groups throughout the length of the activity.
- Font on handout can be modified to be larger or a different colour according to visual needs.

**Assessment**

The handout can be collected and utilized as an Assessment **for** Learning to evaluate how well they have understood the lesson’s content and if they require anymore clarification. Furthermore, it can be used as an Assessment **of** Learning if you wish to evaluate your students in a summative manner.

**References**

GeoPard Agriculture. (2022, March 29). *What is polyculture farming?*. GeoPard Agriculture. <https://geopard.tech/blog/polyculture-farming-methods-advantages-and-disadvantages/>

HGTV. (n.d.). Can you mix potting soil with garden soil? HGTV. <https://www.hgtv.com/outdoors/gardens/planting-and-maintenance/can-mix-potting-soil-with-garden-soil>

Hoose, S. (2020, November 17). *Does growing basil with tomatoes make the tomatoes sweeter?* Home Guides | SF Gate. <https://homeguides.sfgate.com/growing-basil-tomatoes-make-tomatoes-sweeter-73850.html>

Knott, S. (n.d.). *Three Sisters Garden*. Matrix Lesson. <https://agclassroom.org/matrix/lesson/297/>

Kogut, P. (2022, May 19). *Monoculture Farming Explained: What are the pros and cons?* EARTH OBSERVING SYSTEM. <https://eos.com/blog/monoculture-farming/>