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Soilless Culture; Growing Green Innovations

Believe it or not, some plants can grow without soil. This type of gardening is called hydroponics. *Hydro* is the Greek word for "water" and *ponics* means "work". In hydroponic gardening, a solution of water and nutrients does the work of soil. Some horticulturists (gardeners) think it's a more efficient way to grow plants. They say it allows the plant to put more energy into developing leaves, flowers, and fruits and less energy into its root system.

As a concept, hydroponics has been around since the beginning of time. As a science, it is quite new. Hydroponics has only been used in commercial production for approximately 50 years. In that time, it has been applied to both indoor and outdoor farms, to growing premium produce, to feeding third world countries and to applications in the space program.

Plant physiologist Ray Wheeler checks onions being grown using hydroponic techniques. The other plants are Bibb lettuce (left) and radishes (right). Image courtesy of NASA, Kennedy Space Center

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Why Use Hydroponics?

Large scale hydroponic gardening can be complex and expensive, but it offers the following advantages:

- **Healthier Plants.** Hydroponic gardens are easier to keep disease free.
- **Water Conservation. M**ost of the water in a hydroponic garden is recycled. Hydroponics also saves an incredible amount of water; it uses as little as 1/20 the amount as a regular farm to produce the same amount of food.
- **More Efficient Use of Land.** On average, one acre in a hydroponic greenhouse can produce as many vegetables as 28 acres of farmland. For example, a small hydroponic grower with just 5,500 square ft. of greenhouse space (that's 1/8th of an acre) can grow as much as 50,000 lbs. of hydroponic tomatoes annually.
- **Less Pollution.** Everything in a hydroponic garden recirculates. As a result, there is less chance for human-made fertilizers to enter the water supply.
- **Versatility.** A small hydroponic garden can be set up almost anywhere.

Hydroponics Beyond the Farm

The US Navy is growing fresh vegetables on submarines in highly specialized hydroponic systems to help supply fresh vegetables for the crews.

NASA is experimenting with hydroponic systems to be used to feed people in space. Many experiments have been conducted in laboratories and on recent space shuttle missions.

Conduct Your Own Hydroponic Experiments at Home

Materials

- 8-ounce (or larger) cup with lid
- straw
- a few cotton balls

- plant seedling or cutting (lettuce; an herb such as basil; a houseplant such as coleus; or an annual plant such as a marigold or a zinnia), about 1 inch high with roots
- plant fertilizer
- tap water
- knife

Procedure

1. With the knife, cut an X in the middle of the lid. (ask a parent or grown up to help you with this part)
2. Cut a smaller X about 1 inch from the outer edge of the lid.
3. Gently rinse off any soil from the roots of the plant.
4. Carefully stick the roots of the plant through the large hole in the lid.
5. Insert the cotton balls between the stem and the edge of the hole to hold the plant in place.
6. Mix the nutrient solution, following the instructions on the fertilizer label. Fill the cup with the solution.
7. Place the lid on the cup. Make sure that all of the roots are covered with solution.
8. Insert the straw through the X-shaped hole near the edge of the lid. Blow through the straw gently. This will add air to the water. Do not suck on the straw or you'll get a taste of dirty water.
9. Place the cup in a sunlit area, such as a windowsill. Add water as needed.
10. Change the nutrient solution every two weeks.

Questions to think about:

- What do plants need to grow?
- What are some advantages of growing plants hydroponically?
- Why do you think scientists and inventors experiment with hydroponics?
- Have you eaten food that was grown hydroponically?