

LEVELED BOOK • U

How to Build a Greenhouse



Written by Steven Accardi

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Introduction

For decades, gardening ruled over all other **hobbies** in the United States. Even difficult winter weather **conditions**—heavy rains, harsh winds, fierce hail, deep snow—could not keep many people from doing what they enjoyed. People have looked to indoor gardening as a way to maintain or enhance their hobby for hundreds of years. Indoor gardening allows people to keep plants growing for months when outdoor conditions make it difficult, and often helps crops of vegetables and flowers to be grown year-round.



Plants are fully protected from the cold in the indoor greenhouse (above) and receive some protection outdoors with these glass covers (left).

One type of indoor gardening uses a **greenhouse** to grow plants throughout the year. Greenhouses keep out varying weather conditions and temperature extremes, and preserve ideal conditions for plants to grow. The roof and walls of a greenhouse are usually made of glass or plastic. The **humidity** is kept fairly high, natural light is at a maximum, and carbon dioxide is trapped inside for plants to breathe. Some gardeners grow their entire crop in a greenhouse, while others use it to **germinate** plants before moving them outside.



The History of Greenhouses

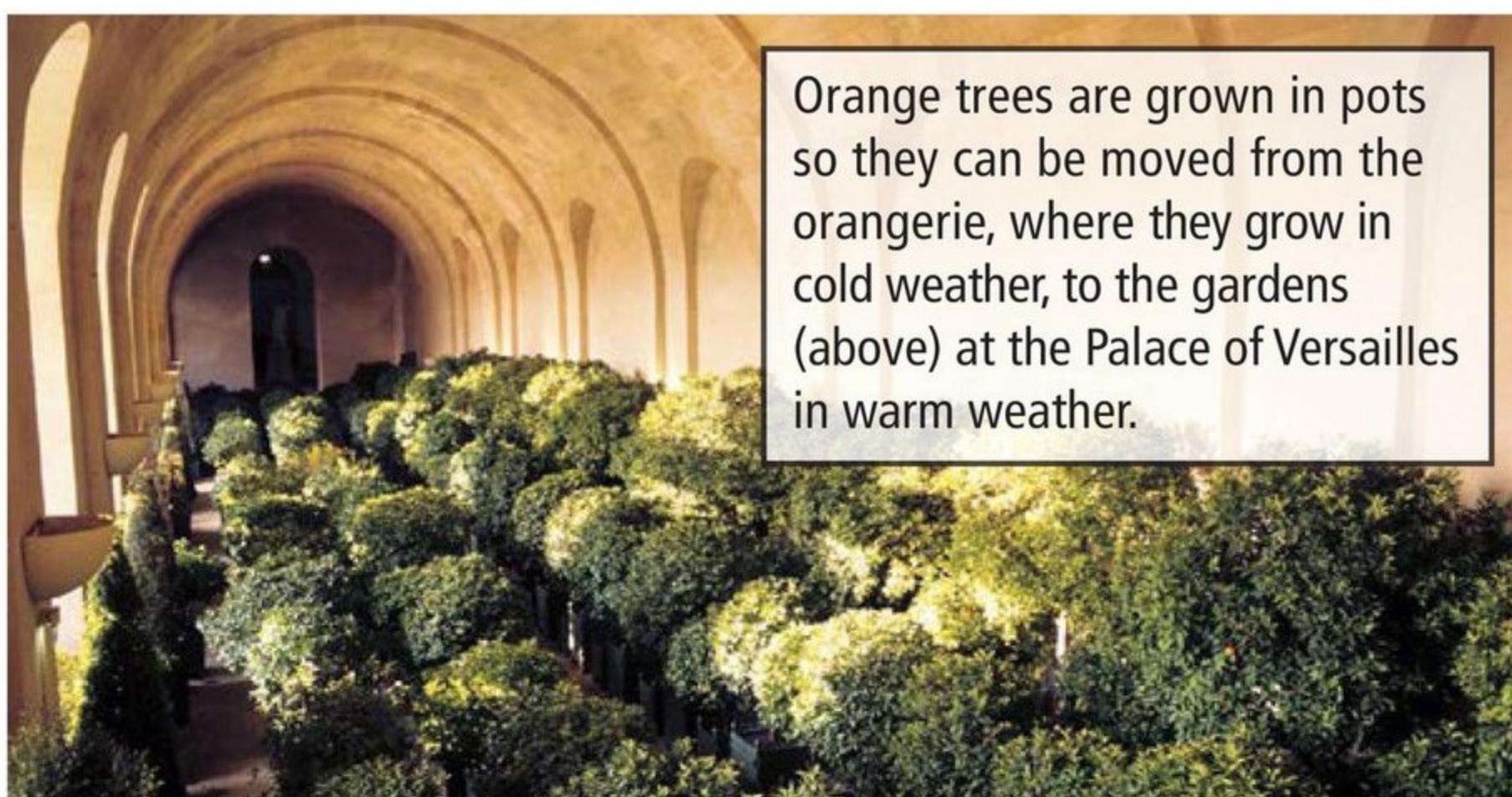
Greenhouses have been used since ancient Rome. Legend has it that in AD 30, the Roman emperor Tiberius became ill. His doctor recommended that the emperor eat a cucumber every day in order to regain his health. This presented a challenge to Tiberius's gardeners. How could they keep the green vegetable growing all year long? They decided to plant the cucumbers in large clay pots and cover them with a thin, glass-like mineral called mica. The mica greenhouse was able to gather sunlight, keep the soil moist, and protect the cucumbers from temperature changes.

Hundreds of years later, in the sixteenth century, Europeans began exploring and trading with people from various places all over the world. Many Europeans would often return home with new and unique plants. However, those plants often could not survive the colder, and sometimes harsh, European **climate**. In order to keep those rare plants alive through the winter, a shelter was designed to keep them growing. The people of Italy were the first to construct what we consider modern greenhouses. Holland and England followed closely behind.

The creation of greenhouses sparked an upsurge of interest in **botany**, or the study of

plants. Colleges and universities, and even average gardeners, began trying to collect, **classify**, and grow—or at least keep alive—all the known varieties of plants.

The people of France in particular had a fascination with one foreign plant: the orange tree. They began constructing “orangeries” to protect this fruit, native to warmer climates in Asia, from frost. During the seventeenth century, using new technology and improved glass, the French began redesigning their greenhouses in style and size—the largest and most ornate at the time being one at the Palace of Versailles, which was over 500 feet (152 m) long, 42 feet (13 m) wide, and 45 feet (14 m) high.



Orange trees are grown in pots so they can be moved from the orangerie, where they grow in cold weather, to the gardens (above) at the Palace of Versailles in warm weather.



Workers check the
watering system in this
flower greenhouse.

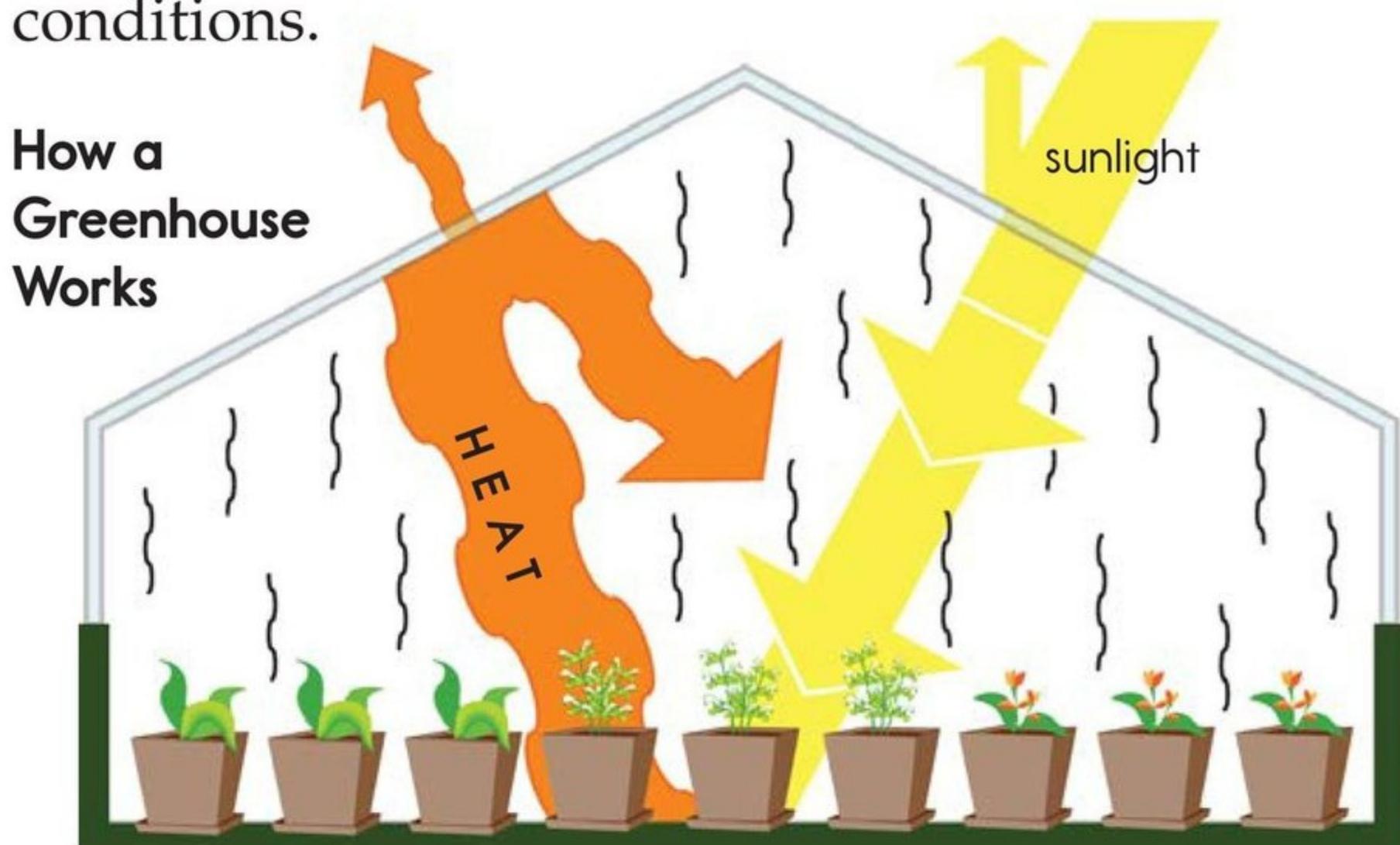
Today, greenhouses are used around the world to supply stores with food and flowers year-round. Grocery stores can now stock fruits and vegetables year-round instead of just during the season when they mature in nature. Spring flowers can now be sold by florists in the middle of winter.



Fruits and vegetables are available in grocery stores year-round in part because of greenhouses.

How Greenhouses Work

Greenhouses allow plants to grow fuller and faster than if they were outdoors, exposed to the weather. How can a simple structure of glass (or plastic) do that? A lot depends on the light. Light has different **wavelengths**. The short waves from the Sun pass through the glass. The plants use this light to convert carbon dioxide and water into food, which allows them to grow. This process is called **photosynthesis**. Once inside the glass, the Sun's light is absorbed by the plants and other materials in the greenhouse. The plants and materials release the extra energy gained from the Sun's light as heat. This heat, which is a longer wavelength, cannot pass back through the glass, so it acts like a blanket, raising the temperature and humidity of the greenhouse to ideal growing conditions.



Heat radiates from all surfaces in a greenhouse.

Finding a Good Location

Before picking up the tools and supplies to build a greenhouse, you must find the best location in your house or yard. The greenhouse you will build using this book works best inside your house, but many greenhouses are separate buildings or are attached to the outside of an existing building. When choosing a location inside, there are three major factors to consider: sunlight, heat, and ease of use.

First, you should ideally find a window that faces south or southeast to give your greenhouse

maximum sunlight. If that's not possible, find an east-facing window for at least morning sunlight so that photosynthesis can begin and continue throughout

the day. Second, the window you choose should be away from furnace vents or other heat sources, as your greenhouse will be warm enough with the right amount of sunlight. Third, you should put your greenhouse in a place where you can easily check on your plants but where it will not be disturbed by other daily activities.



Choosing a Greenhouse Location Outside

When choosing a location outside, consider three factors:

1. Sunlight: Spend a day observing the shade created in your yard before placing your greenhouse. The greenhouse should receive as much sunlight as possible throughout the day.

2. Drainage:

Choose a spot with natural drainage or a place that is on higher ground so that rainwater can drain properly.

3. Wind: Find a place where your greenhouse can be sheltered from cold winter winds. This might be along the side of your house or within a group of evergreen trees (which will protect it from cold winter wind and intense sunlight on summer afternoons). Just make sure your greenhouse still receives plenty of light in the winter.



Building a Cardboard Box Greenhouse

Many greenhouse designs can be constructed over a weekend at a fairly low cost. Some are simple, while others are complex. All of them

require patience, focus, and a willingness to have fun. The following greenhouse is a bit unconventional. It's smaller—in the space of a cardboard box—than the average greenhouse and can be enjoyable to make with a parent or family member as a weekend project.



Materials

- 1-12"x12"x16"
(30 cm x 30 cm x 40 cm)
cardboard box
- utility knife or scissors
- ruler
- pencil
- 2 square feet(.2 sq m) of
aluminum foil
- craft glue
- gray duct tape
- potting soil
- small plant pots
- seeds
- water
- 10 wooden clothespins
or small binder clips
- small rocks or stones,
enough
to make a 1"(2.5 cm)
layer in your box
- 2-24"x 36"
(61 cm x 91 cm)
sheets of clear plastic
film at least 1.75
millimeters thick and
up to 6 mm thick



Construction

- ➊ Use the ruler and pencil to measure and mark 4 inches (10 cm) up from the bottom of the cardboard box along the 12-inch (30 cm) side. Make a couple of marks. Draw a straight line across the box at the 4-inch (10 cm) marks you made, being sure to draw the line about an inch or two (2.5-5 cm) around the corners to each long side of the box.



- ➋ Use the ruler and pencil to draw a diagonal line from the 4-inch (10 cm) line on the long sides up to the opposite corner at the top of the box so your box appears to be almost two triangles. Cut along the lines you have drawn.

3 Spread the craft glue on the bottom and sides of the box. Work quickly so the glue does not dry, or glue a section of the box at a time.



4 Line the inside of your box with the aluminum foil, tearing or cutting it to fit and then pressing it in place over the glue. Be sure the shiny side of the foil faces into the box.

- ⑤ Line the bottom of your box with one of the plastic sheets, being sure to tuck it into the



corners as much as possible. Use the duct tape to attach the plastic to the box where the plastic and aluminum foil meet. Be sure the glue on the foil is dry before using the tape.

- ⑥ Pour small rocks or stones in a one-inch (2.5 cm) layer in the bottom of your plant pots. This will provide drainage for the roots of your plants.

Pour a layer of potting soil on top of the stones or rocks to fill the pot within one inch of the top.



7 Plant your seeds in the plant pots according to the directions on the package. If you plant different types of seeds, be sure that each requires the same amount of sunlight and water. It will be difficult to maintain different growing conditions inside your greenhouse box.



8 Use the clothespins to attach the second sheet of plastic to the top of your box. Now you have a greenhouse. Place your greenhouse in a sunny location inside your house and watch your seeds sprout.



Tips for Greenhouse Care



Check on your greenhouse about once a week. Be sure the soil inside your greenhouse stays moist, but not wet. After the initial watering of your

seeds, use a spray bottle of distilled water (water that has been left out overnight in a container with no lid) to keep your plants watered. You may notice some water form on the inside of the plastic cover. This is normal, but make sure the soil is not too wet. If the soil does become too wet, pull back the plastic sheet so the greenhouse can dry out some before re-covering the box.

After your seeds have germinated, weed out the weakest plants. Leave only the strongest plants in the small space of the greenhouse. You can make the strong plants stronger by feeding them plant food or compost after weeding out the weaker plants. Do this only if the plants will later be moving to a garden outside. Plant food and compost will likely make the plants outgrow your indoor greenhouse too quickly if you want them to remain indoors during their whole growing cycle.



Conclusion

You now have a place in which you can enjoy gardening year-round like other gardeners around the globe. You can try growing plants, fruits, vegetables, seedlings, and flowers in your protected cardboard greenhouse, even when there is snow outside. Maybe you'll be able to keep cucumbers growing in the heart of winter.

Keep the Outside Dry!

Check the cardboard box every so often to make sure the outside remains dry. If you notice any water on the outside (including the bottom), you might have to replant your greenhouse in another box.



Glossary

botany (n.)	the study of plants (p. 6)
classify (v.)	to assign things or people to categories (p. 7)
climate (n.)	the weather conditions in an area over a long period of time (p. 6)
conditions (n.)	a set of circumstances necessary for something else to happen (p. 4)
germinate (v.)	to begin to grow from a seed (p. 5)
greenhouse (n.)	a structure often made from glass or plastic that is used to grow plants that need heat, light, and protection from harsh weather (p. 5)
hobbies (n.)	activities done for fun and relaxation (p. 4)
humidity (n.)	the amount of moisture in the air (p. 5)
photosynthesis (n.)	the process by which chlorophyll in plant cells transforms sunlight and nutrients into food (p. 9)
wavelengths (n.)	the distances between consecutive peaks or troughs of a wave (p. 9)

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